FAWCETT'S

MODERN MECHANICS AND INVENTIONS

JAN. 25c

HOW TO MAKE A MERRY-GO-ROUND ON ICE SEE PAGE

MAKING MAGIC for MAGICIANS

Over the Mountains from Los Angeles 559 Miles on 11 Gallons of GAS

Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 14 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to the gallon and 25% in speed. We placed another on a Willys-Knight and increased from 12 to 17 miles per gallon."

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I have saved in gasoline these last few years has brought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

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In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED

To Make up to $100.00 a Week and More

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MANUFACTURING CO.
999—409-A, Third Street Milwaukee, Wis.

GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

FREE OFFER COUPON

WHIRLWIND MANUFACTURING CO.,
999—409-A, Third Street, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one Free. This does not obligate me in any way whatever.

Name .....

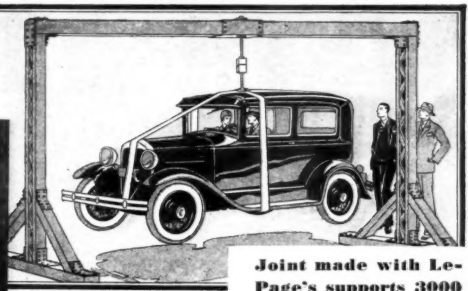
Address .....

City .....

County ..... State .....

☐ Check here if you are interested in full or part time salesmen position.

Wow! But that's a test



Joint made with LePage's supports 3000 lbs. per square inch

You See This Can Wherever You Go

Carpenter Shops
Cabinet Makers
Golf Pro's Bench
Manual Training Schools
Upholstery Shops
In Houses Under Construction
Everywhere!

Hang up your car so all its weight falls on a joint made with LePage's Glue. Climb in. Pile the family in. You're safe. The joint will hold. We proved it by doing it. See the drawing above, made from a photograph.

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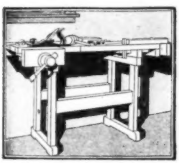
Any cabinet-maker will tell you your finished work is as good as the strength and permanency of its joints. Use LePage's Glue—Liquid, Hard or Waterproof—and be assured of immense and lasting strength. Stands pressure of 3000 lbs. per sq. in. Stronger than the fibers of the wood it joins. Every batch tested.

LE PAGE'S GLUE

WHATEVER KIND OF GLUE YOU NEED LEPAGE'S MAKES IT!



You Can Make This Work Bench Yourself

Here's the Work Bench you've always wanted for your home work shop—practical and substantial. Any man handy with tools can easily make it with the help of LePage's Glue and LePage's Job Plan No. 24, containing step-by-step printed directions how to make and dimension drawings of every part. Price complete only 10 cents. Order direct, enclosing 10 cents, stamps or coin. LePage's Craft League, 762 Essex Ave., Gloucester, Mass.

LE PAGE'S NEW WATERPROOF GLUE

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LE PAGE'S TESTED HARD GLUE

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Other Fawcett magazines are Screen Play Secrets, Triple-X, Battle Stories, True Confessions, Mystic Magazine and Hollywood.

MODERN MECHANICS AND INVENTIONS

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This magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

Vol. V — No. 3

January, 1931

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HIGH SPOTS IN THIS ISSUE

Do you want your hidden powers and talents revealed to you? If so, turn to page 99 and see our offer of a free handwriting analysis. Plans for the M-M secondary glider begin in this issue, while on page 121 you will learn how to obtain your glider pilot's license. The world's most dangerous occupations are described in the opening feature.

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Listed here are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers if stamped envelope is sent. Address them in care of this magazine, 529 S. 7th St., Minneapolis, Minn.

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DID you ever stop to think how the decision made on the impulse of a split second may eventually lead a man to success such as most people only *dream* of?

For example, when William Shore of Lake Hughes, California, stumbled upon a magazine page describing this self-same plan for raising men's pay, he was only a cow-puncher. But some inner "punch" caused him to fork-stage for a moment and read. In that instant, *the die was cast!* Today Shore is making as high as $125 a week, with bigger and bigger prospects for the future. . . . So it was with F. B. Englehardt of Chattanooga. He, too, mailed the coupon below and was rewarded by raising his pay $4800 a year—an increase of 200%!

Thousands of others can tell you similar experiences which occurred after they read the pay-raising book —"The Key to Master Salesmanship," —now offered to you free. . . . And if it could do *half* as much for you as it did for Englehardt—wouldn't it be worth your while and a 2-cent stamp to get a chance to look it over?

Salary Increases 200% to 900%

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NATIONAL SALESMEN'S TRAINING ASSOCIATION
Dept. A-703, N. S. T. A. Bldg., Chicago, Ill.

THE FIRST STEP

Amazing things have happened as a result of mailing the coupon below. For example, when M. Hartshewich, of Dale City, California, mailed it, he was a restaurant worker at $8 a week. Today his salary has skyrocketed to $427 a week.

SEE FOR YOURSELF

The coupon will bring you a FREE copy of what has been called "The most amazing book ever printed." It reveals facts that have led legions of ambitious men to success through the hitherto untold profession in the world!

FREE EMPLOYMENT SERVICE

This man-building volume not only shows you an astonishingly simple way to master the in-and-outs of scientific salesmanship, but also explains the N. S. T. A. free employment service. Requests for over 50,000 trained men were received last year.

REAL MONEY AT LAST

If you want to raise your pay $2500 or more, you owe it to yourself to see exactly why this remarkable book interests men sending so quickly. You'll never find a better way to invest a 2c stamp than in mailing the coupon below. Do it now!

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Without cost or obligation you may send me your free book, "The Key to Master Salesmanship," and tell me about your Employment Service and other features of the N. S. T. A.

Name .....

Address .....

City ..... State .....

Age ..... Occupation .....

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Accountancy Home-Study

made *interesting* and *practical* thru *problem* method

YOU know as well as we do that Accountancy fits many men for positions that pay three and five and ten thousand dollars a year—gives many other men unusual opportunity to start a profitable growing business of their own.

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*Names and addresses given on request.

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For Accountancy is no magic wand for the lazy or the fearful or the quitter—it offers success only to the alert adult who has the courage to face the facts and the will to carry on till the job is done.

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LaSalle Extension University

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Name.....

Address.....City.....

Position.....Age.....

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Name ..... Age .....

Address .....

Town ..... State .....

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"The Universal University"

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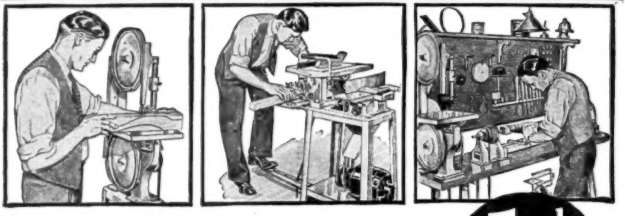

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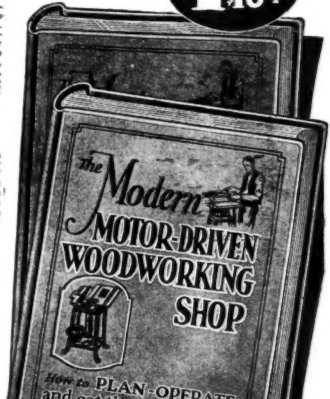

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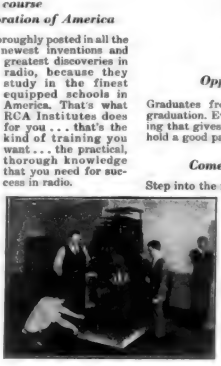

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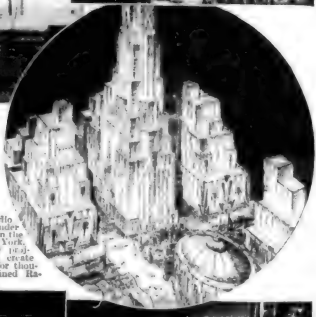

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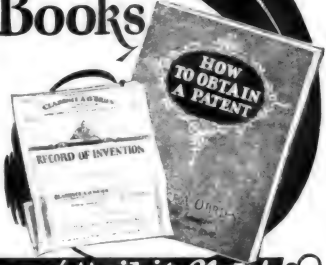

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This is the businesslike biplane built by the Rathel Electric Company of Daleville, Indiana. It is powered with a converted Chevrolet motor and is said to have turned in some good flights.

Andy's Shop Mail Box

THE SEASON'S GREETINGS, GANG! By the way, have you taken a look-see at the Plane Talk department yet, or do you always read my stuff first? We have it straight from the North Pole that, what with hearing the results of the last census, etc., Santa Claus has went and bought himself one of them there air trains to deliver his Christmas cheer.

This grease-monkey's modish cover-alls are now stained with mortar and white paint, for I have just returned from erecting a new chimney on top of the hangar and painted direction arrows on the tarmac to guide the venerable Mr. Claus to the new smoke stack. Now if I can find a sock without holes I am going to hang it under the chimney and wait for that new monkey wrench.

* * *

THE plane at the top of the page looks a whole lot to this hombre like a souped up Lincoln Baby Biplane, plans for which were published in the 1930 FLYING MANUAL. But evidently it isn't, because it is the biplane built by the Rathel Electric Co., whose full address is Daleville, Indiana. The ship is powered with the new R-2 engine, made from Chevrolet parts. The motor you can see is of the overhead valve type. The Rathel people also have a monoplane which can be flown with a Ford model A motor. I haven't seen any of their line, but I'm passin' "the know" along to you before others get hold of it, an' maybe a letter would get you a folder. I think they have some dope on their stuff in printed form.

* * *

OLIVE BORDEN and June Clyde, the popular movie stars, dropped in at the hangar not so long ago. Olive said she reads my column regularly, so if she reads this I expect her to drop me a line saying so. You see, Olive, I'm checking up on you.

But what I started to say was that we were comparing fan mail, and while I'm not much to look at, you'd be surprised to know that the postman here is just as round-shouldered as the one out in Hollywood. (Editor's Note: They've got two out there.)

Among this mountain of mail is a letter and photo which I am passing on to you. The picture is at the left.

Covington, Ky.

Dear Andy:

Here is a photo of a car which is now completed. This outfit carries a streamline two-passenger body and is built special from the ground up.

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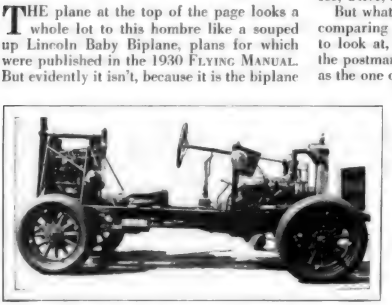
(Continued on page 28)



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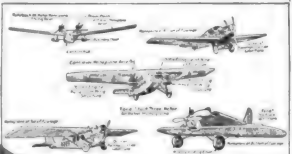

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(Continued from page 20)

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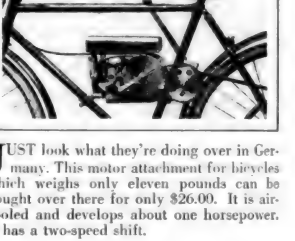

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(Continued on page 36)

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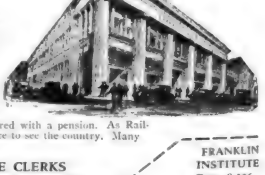
Railway Postal Clerks now get $1900 the first year regularly, being paid on the first and fifteenth of each month. $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year. $112.50 each pay day. They get extra allowance for hotel expenses when away from home.



PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). When on runs they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country. Many spring examinations expected.

CITY MAIL CARRIERS—POST OFFICE CLERKS

Clerks and Carriers get $1700 the first year regularly and automatically increase $100 a year to $2100 with further special increase to $2300. They also have 15 days' vacation. Many February examinations expected. City residence is unnecessary.

What Will You Earn 5 Years From Now?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, kicking around from post to pillar, no chance in sight for PERMANENT employment; frequently out of a position and the year's average salary very low. DO YOU EARN $1000 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2200 OR MORE A YEAR, EVERY YEAR?

FRANKLIN INSTITUTE
Dept. S-306
ROCHESTER, N.Y.

Rush to me entirely free of charge 32 page book with (1) a full description of the position checked below; (2) a list of U. S. Government jobs now obtainable; (3) tell me how to get the position checked.

MAIL COUPON TODAY

—Railway Postal Clerk	($1900-$2700)
—Post Office Clerk	($1700-$2300)
—City Mail Carrier	($1700-$2100)
—Rural Mail Carrier	($2100-$3300)
—General Clerk and File Clerk	($1260-$2500)
—Inspector of Customs	($2100 up)
—Immigrant Inspector	($2100 up)

Name .....

Address .....

Use This Coupon Before You Mislay It—Write or Print Plainly

Get FREE List of Positions

Fill out the coupon. Tear it off and mail it today—now, at once. DO IT NOW—This investment of two cents for a postage stamp may result in your getting a U. S. Government Job

Thank You for Mentioning Modern Mechanics and Inventions for January When Writing to Advertisers

Learn Art This Quick Modern Way

COMMERCIAL Art needs more men! Many fine positions that pay BIG MONEY are waiting for trained men to fill them. Thousands of advertisers are buying hundreds of thousands of dollars worth of art work. Newspapers and magazines need illustrators and cartoonists, and will pay them BIG SALARIES. Year-'round work—a steady income—SUCCESS—all await the man who realizes the wonderful opportunities an art career holds in store for him.

Learn In Your Spare Time at Home

You don't have to be a "born genius" to become a successful commercial artist. If you like to draw, you can soon develop and train your natural talent in your spare time at home. Hundreds of men have climbed the ladder of success to INDEPENDENT INCOMES with the help of a Federal School Course. Read what some of these men say—then make up your mind that you can do it too.

Federal Students Make Good Incomes

The earning capacity of commercial artists is practically unlimited! Federal School students and graduates are making $2,000, $3,000, $4,000, $5,000 and $6,000 a year—some even more. The opportunities are there if you will only prepare for them. You, too, can leave behind the drudgery of monotonous toil and labor for a pleasant, good paying position. Youth is an asset—experience you can gain while you are earning. Investigate this wonderful chance at once.

Send for This FREE Book

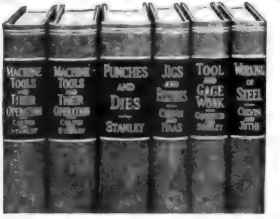
The Federal Course in Commercial Designing, which teaches you to make drawings and designs for magazine and newspaper advertising, posters, booklets, etc., is fully described in our book let, "YOUR FUTURE". Your work in this course will receive individual, personal criticism. You will be quickly trained so that you can begin earning money in the shortest possible time. Send for this FREE book at once—use the coupon.

FEDERAL SCHOOL OF COMMERCIAL DESIGNING
2060 Federal Schools Bldg., Minneapolis, Minn.

Please send me your FREE book, "YOUR FUTURE", and Art Questionnaire, without obligation.

Name .....
Present Occupation .....
Age .....
Address .....

BIG Demand for Skilled Mechanics!



These books will qualify you for a big-pay job!

The American Machinists' Library—six big volumes packed to the covers with sound, pay-raising information—puts training right within your arm's reach. The books are the last word on modern machine shop practice—the most complete, the most thorough, the most practical set of books ever published in this field. Use them to increase your earning power—to win promotion!

AMERICAN MACHINISTS' LIBRARY

6 volumes—2,000 pages—2,500 illustrations
(A combined home-study course and reference library)

This Library was written from the practical man's viewpoint. Every word—every illustration is easy to grasp and apply, yet its treatment is so accurate that it is used as a constant reference work by experts in the best-known shops of the country. It explains the simple principles of shop work, then carries you quickly and surely over to the more intricate operations that every mechanic has to know in order to command a higher daily wage. Every topic is thoroughly covered to insure perfect mastery. These books are rich with the essentials of advanced methods, used by men who receive big pay for "knowing how."

They give you in convenient easily understood form more worthwhile knowledge and time-saving suggestions than any one man could possibly gain in a lifetime of practice.

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8 Months to pay**

10 Days FREE TRIAL Just Mail the Coupon

On receipt of the coupon we will send the books to you, all charges prepaid. You look them over for ten days. If you like them—send us your first payment of $1.50. The balance you pay at the rate of $2.00 a month until the special price of the set has been paid.

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., Inc., 370 Seventh Ave., New York

Send me for 10 days free examination the AMERICAN MACHINISTS' LIBRARY. If satisfactory, I will send $1.50 in 10 days and $2 monthly until the special price of $17.50 is paid. If not wanted, I will return the books at your expense.

Signed .....

Address .....

City and State .....

Position .....

Company .....

MM-1-31

Andy's Shop Mail Box

(Continued from page 28)

Nothing is as interesting to people as are other people. That's why letters are so interesting. They clearly indicate what is going on in the other man's mind, and give us that keenly interesting cross section of life we can get no other way. Take this letter for instance:

Flushing, L. I., N. Y.

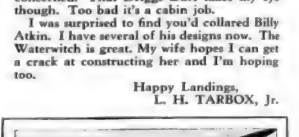
Hello Andy, old son:

I'm setting down on three points again to do a little ground flying. What say we discuss the last three ships you have given us.

That Longster isn't bad at all. Couple of boys at the American Eagle built one with an Anzani for power. Flown it too, nice and stable, fair performance, floated a hellova long time but poor visibility. I like the Georgias much better as far as that point is concerned. That Driggs Dart takes my eye though. Too bad it's a cabin job.

I was surprised to find you'd collared Billy Atkin. I have several of his designs now. The Waterwitch is great. My wife hopes I can get a crack at constructing her and I'm hoping too.

Happy Landings,
L. H. TARBOX, Jr.



And here's another letter, this time from the President of the Iowa State College Glider Club:

I am enclosing a photograph of an improved type of glider which was recently built by the Iowa State College Glider Club. We decided that a strictly American type should be developed, not only because we did not want to be second to some foreign genius but because we saw in the imported designs only the fundamentals of a glider.

One of the new features is the floating ailerons, working on the same principles as the Curtiss Tanager ailerons. Another feature is a spring skid which gives eight inches and works on a combination of friction and spring so that the rebound is very small. A third is a very light combination of wire and tubing to make a very light yet strong and rigid frame.

This glider has been flown over a hundred

(Continued on page 38)

FREE-

the BOOK *that has shown* 20,000 *others the way to* BIG MUSCLES!

Reveals the secrets that won me the title of "*The World's Most Perfectly Developed Man.*" . . . Tells how YOU can win a handsome, healthy, HUSKY body—my quick *Dynamic-Tension* way!

—By CHARLES ATLAS

"The World's Most Perfectly Developed Man"

JUST jot down your name and address on the coupon below, mail it to me—and I'll send you absolutely free of charge a copy of my big new book.

Then read the fascinating story of how I take underdeveloped, no-muscle men of all ages and give them big, powerful muscles, increased measurements, amazing strength and endurance—*all in a few minutes of leisure time daily at home.*

Easy My Way

No tiring apparatus my way — my natural *Dynamic-Tension* method does the work. No pills, "trays," fussy dieting, or other unnatural "schemes." In my free book I explain the principles of *Dynamic-Tension* that I discovered and used to build myself up from a 97-lb. WEAKLING to the CHAMPION of them all—"*The World's Most Perfectly Developed Man*."

I've helped thousands of other men, youngsters and oldsters, fat and skinny. Some were weak, run-down specimens that looked like scarecrows before I showed them my QUICK way to add weight, get smooth, even layers of powerful muscle and the handsome, evenly-balanced proportions that you see in my own photos.

PROOF That You Can Be This NEW MAN

Now I'll give YOU the PROOF in only 7 DAYS that I can turn you, too, into an "Atlas Champion"—make a NEW MAN of you—give you a handsome, HUSKY BODY, give you big, POWERFUL MUSCLES, put on POUNDS of firm flesh, or if you are fat pare you down to FIGHTING TRIM.

And with this NEW FIGURE I'll give you NEW HEALTH—the through-and-through health that rids you of constipation, pimples, skin blotches and that half-alive, played-out feeling that does you out of the good times and the good things of life.

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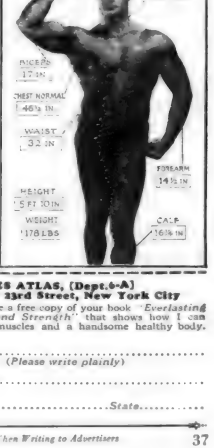
Why be only 50% of the man you can be? Join the regiment of Atlas Champions that stretches clear across the United States. Send NOW for a free copy of my new book containing scores of pictures of myself and the others who have used my methods. Then become the NEW MAN I'll prove you CAN be. Don't delay—mail the coupon NOW for YOUR free copy of my new book. Address CHARLES ATLAS, (Dept. 6A) 133 East 23rd Street, New York City.



CHARLES ATLAS, (Dept. 6-A)
133 East 23rd Street, New York City

Send me a free copy of your book "*Everlasting Health and Strength*" that shows how I can win big muscles and a handsome healthy body. Mail to:

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(Please write plainly)

Address.....

City.....State.....

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CONSOLE RADIO

ALLIED RADIO CORPORATION

711 W. Lake Street, Dept. 494, Chicago.

Andy's Shop Mail Box

(Continued from page 36)

times to date, mostly by fellows without previous experience. Car towing is used exclusively and the injuries so far are one scratched finger. It has been found that but sixty seconds of ground instruction are necessary to allow the new man to take the glider into the air.

Sincerely,
C. N. SANFORD.

* * *

AND just to show you that great minds frequently duck down the same alley, grab a load of this one:

Dedham, Mass.

Dear Sirs:

While persuing the pages of a back issue I noticed the article about the flying sub belonging to the Danish government. It might interest you to know that we recently completed preliminary work on a craft similar to this.

I am sorry that we can't give you a complete story on this, but it is obvious that secrecy is the best policy in this case.

The design is of such a type that a person not knowing of such a craft would think that it was a regular plane. Armament is carried as well as radio and television outfits. It can obtain about 125 m.p.h. in the air. As no tests have been made yet we cannot state what the performance will be as a sub or boat.

In regards to the dirigible anchor (P. 124 Vol 30) could you tell me what holds the gas bag while the aforesaid anchor is freezing? I understand that high winds predominate in these regions.

Very truly yours,
WM. B. HARTY.

P. S. Tell the Grease Monk that he takes up too much space with his bull.

Choosing to ignore the last crack, I might state that the dirigible could head into the wind and keep the engines running just fast enough to hover o'er (poetical) the spot until the ice anchor froze in place. And don't forget that we expect an exclusive story on that sub of yours when you have it ready.

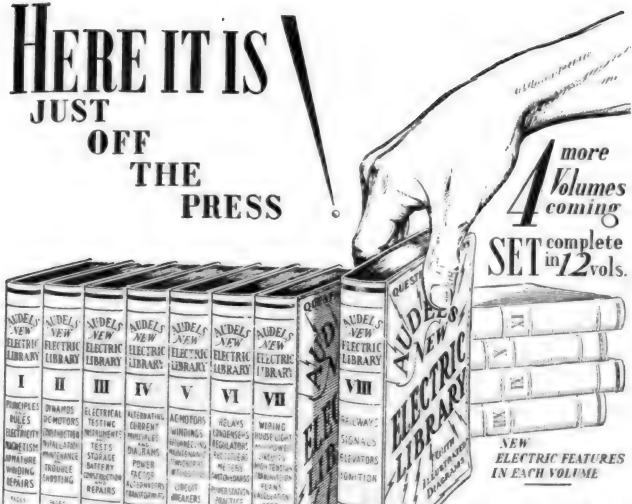
* * *

FOR the information of those who are contemplating building the Georgias Special, the correct wing chord of that nifty little ship is 48 inches, and not 54 as it states in the text. Orv. promises to furnish a drawing of the wing ribs free to anybody who writes for one. His address is: Shank Flying Service, Robbinsdale, Minn. "Pretty nice of Orville," say we.

Incidentally, Hickman now has blue-prints for this crate for which he asks five bucks.

(Continued on page 40)

HERE IT IS
JUST OFF THE PRESS



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DRAFTING pays good salaries and is the stepping stone to even better positions. Many leading architects, mechanical engineers and electrical engineers got their start at the drafting board.

There is no easier or more practical way to learn Drafting than through the home-study courses of the International Correspondence Schools. Employers are constantly writing us for trained men. We receive more calls for I. C. S. draftsmen than for graduates of any other course.

F. E. King was "a poorly paid clerk" when he enrolled for the I. C. S. Drafting Course. By study, industry, and perseverance he became Chief Draftsman of the U. S. Steel Furniture Company, of Syracuse. He is now earning more in a day than he used to earn in a week.

A. J. Hutchins became Chief Draftsman for the American Strawboard Company and increased his salary 300 per cent—also as a result of I. C. S. Training.

Just mark and mail the coupon and we'll gladly send you a booklet telling all about the I. C. S. courses in Drafting or other subject in which you are interested.

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Without cost or obligation on my part, please send me a copy of your 48-page booklet, **"Who Wins and Why,"** and tell me how I can qualify for the position, or in the subject, *before* which I have marked an X:

☐ **Mechanical Drawing** ☐ **Structural Drafting**
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☐ Telephone Work
☐ Mechanical Engineer
☐ Machine Shop Practice
☐ Toolmaker
☐ Patternmaker
☐ Civil Engineer
☐ Surveying and Mapping
☐ Bridge Engineer
☐ Gas Engine Operating
☐ Automobile Work
☐ Aviation Engines
☐ Plumber and Steam Fitter
☐ Plumbing Inspector
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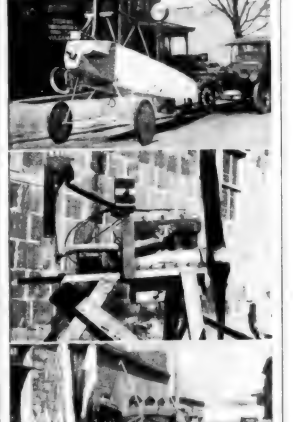
City ..... State .....
Occupation .....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian Limited, Montreal, Canada

Andy's Shop Mail Box

(Continued from page 38)

Ford Powered Monoplane



The Storms Aero Co., Spartanburg, S. C., send us these shots of their Ford powered monoplane fuselage. It is neat, simple and strong-looking.

RUSS DYE, who used to be a "Sparks" on some of the most disreputable tramps plying the seven seas (so he says), wants to know why I don't say something about raddio in this here collum. The main reason is that I'm a grease monk at a hangar and not a brass pounder in a radio shack. That makes a difference, I reckon.

Russ says that the thrill of listening in on a broadcast is nothing compared to the kick of talking with a fellow amateur who may be

(Continued on page 42)

If you're "On the Outside Looking in"

You need this Free Book

ARE you standing on the sidelines, wishing you were in Aviation . . . envying those who are already making Aviation history while holding down good jobs with fine futures? If so, remember this: — *Wishing won't get you into Aviation—but practical training will!* Walter Hinton's free book, "Wings of Opportunity," tells you a quick, sure, inexpensive way to get the necessary practical training—in your spare time, at home.

Hinton's personalized training and his free Employment Service are putting serious-minded, red-blooded men like you in good flying and ground jobs right along, at salaries of from $40 to $80 a week. Martin Co., Curtiss-Wright, Curtis Flying Service, Alexander Aircraft, T.A.T., Fokker and scores of other *leaders* are employing Aviation Institute graduates. In one day alone, we had calls for more than forty men!

Many other industries have reached their saturation points—and can offer only small-pay jobs with no future. But Aviation is *just beginning to grow!* In Aviation your future can be just as *big* as *you* want to make it. So why sit back? Why drift into something else, when a little foresight and judgment can put you right into the thick and pick of Aviation's opportunities and into a ground or flying job paying from $40.00 to $200.00 per week? Don't say it can't be done. We know it *can*. We're helping other fellows just like you to do it all the time.

Get the Facts—Write For This FREE Book Today

If you're 16 or over—and serious about wanting to get into Aviation, get a free copy of Walter Hinton's book. It tells how he can give you the vital facts, the necessary knowledge of plane-construction, engine-design, rigging, repairing, servicing, airport management, navigating, theory of flight, etc. If you want to learn to fly, his course can save you many times its cost in cash. It's interesting and easy to understand from the start and packed with facts that mean success for you—no matter what branch of Aviation you choose to enter. Mail the coupon today—right NOW.

Now District Traffic Agent for T. A. T.

"When I finished your course I became connected with T. A. T. and am happy to state that promotion has come very rapidly. I shall always be grateful to you for your interest and cooperation." C. E. McCollum, District Traffic Agent T. A. T.—Maddux Air Lines.

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"After completing your course I was engaged as Aeronautical Draftsman by a leading concern. I thoroughly recommend your training. It is complete in every detail." Ira W. Bergen, Brooklyn, N. Y.

* * *

Robt. N. Dobbins, a Hinton Graduate writes: "I cannot thank you enough for the assistance you gave me in getting my present position. Last week they promoted me to Chief Instructor at a salary increase of $15 a week."

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322-V

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No Salesman Will Bother You! For the first time in the history of Magic the age-old, sacredly guarded secrets of Mystic Art are being revealed. Now at last you can learn to be a Real, Professional Magician. Yes, and you can learn this wonderful art *easily and quickly* AT HOME. You are taught the mysterious *Principles* by which the Professional Magician works. But before you can study, you must sign the Magician's Solemn Pledge of Secrecy. This means you are getting the *guarded secrets* of the Magic Profession.

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Gentlemen: Without any obligation send me your free literature and information all about your wonderful "Tarbell Course in Magic." Also tell me about your Low Price Offer and Easy Payment Plan.

Name .....

Address .....

..... *Age*.....

(Continued from page 40)

several thousand miles away. "Such contacts," says he, "are strong and enduring." Which is just another way of saying that he thinks the recent articles on radio in Double M are all to the berries. Well, I think so too, and I'm glad there's more on the way. How do you like this month's low power job?

Which reminds me: do you know that every issue of MODERN MECHANICS plays up stuff for the home workshop, stuff for the electrician, something for those who love boats, the radio fan, always something on motor cars, and an airplane plan? That's the secret of our success. That and taking the bigger stories and playing them up like they should be played, with all of the info crammed in by the man who is the author or originator of the idea.

While I'm handing out hot tips, I'll just pass along the info that you can now get a set of conversion parts for a Ford automobile engine, which will enable the ordinary handyman to make a boat engine from his Model "A" or "T" in about an hour and a half, using nothing but the common tools with which all of you are equipped—a monkey wrench and a screwdriver.

The principal change is in the speeds, together with an extra large water jacket, shaft with prop, thrust block and universal bearing. This universal makes it easy to line up your shaft. If you want more dope on this, write to the Barker Factory, Inc., Norwalk, Connecticut.

I think I'll call it a day, as we're goin' to have some balloons to celebrate the new year and I'll need some of this hot air to blow 'em up. See you later!

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Showing this Scientific Marvel to Men. What Makes It Light? New Principle of Ignition. All Guaranteed. No Flint or Friction. Sample with Sales Plan, 25c. Sample Gold or Silver Plated, $1.00. Agents write for proposition.

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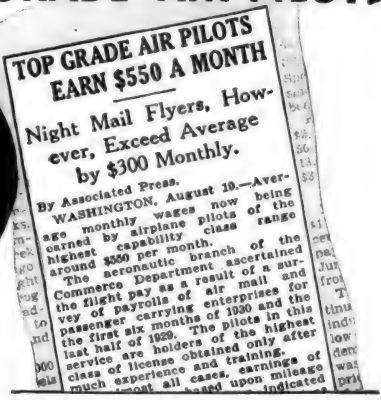
Instructor checking over record of pilot students at Parks Air College and giving helpful information as every Parks instructor is able to give these well-trained students.



TOP GRADE AIR PILOTS EARN $550 A MONTH

Night Mail Flyers, However, Exceed Average by $300 Monthly.

By Associated Press.

WASHINGTON, August 19.—Average monthly wages now being earned by airplane pilots of the highest capability class range around $550 per month.

The aeronautic branch of the Commerce Department ascertained the flight pay as a result of a survey of payrolls of air mail and passenger carrying enterprises for the first six months of 1930 and the last half of 1929. The pilots in this service are holders of the highest class of license obtained only after much experience and training.

TO make good money, get good training. The Government survey shows that "top grade" pilots make an average of $550 per month—*and Parks-trained men make top grade pilots!* At Parks you buy the best training to be had—and qualify for the best-paying positions. You're money ahead in the end. Parks Air College is the alma mater of many of the country's best-known, best-paid men engaged in aviation. Its graduating classes, today, are distinguished more than ever before by the type of student who will make a name for himself.

Do you want men like this for associates? Do you want the kind of an education that is equipping men to be tomorrow's leaders in aviation? Then sit down now and mail the coupon below!

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They EARN Their BREAD

Sig Smith, professional daredevil, walks blindfolded around the thorned crown of the Statue of Liberty.

WHY is a daredevil, anyway—and why is it that firemen, circus acrobats, lion tamers, tight rope walkers, and race car drivers usually live to a ripe old age, or are cut down by measles, pneumonia, and other prosaic diseases which one would naturally expect would have the good taste to avoid these men who daily laugh at death?

There are several reasons why there *are* daredevils. In the first place, they must live the same as other folks, and the rewards in the game are high. Then, too, the daredevil is usually a man with an urge for adventure, and his occupation gives him the thrills he craves. Not all daredevils, of course, hold down spectacular jobs. Your window washer, working 30 stories above the street, is as much a daredevil as the chap who permits himself to be shot out of a cannon.

The qualifications for men who hold down the world's most dangerous occupations, however, are pretty much the same. Steady nerves, a body in perfect physical condition, fearlessness, and something of the instincts of a gambler are required. And above all, a keen brain which can size up a situation, and make hair-trigger decisions when life hangs in the balance. Natural science has a good deal to do with the success of a daredevil, whether he knows it or not. Instinctively, he takes advantage of the laws of leverage, balance, and kinematics.

Take Sig Smith, for instance. Everybody has heard of the Statue of Liberty, though

at the RISK of Their LIVES

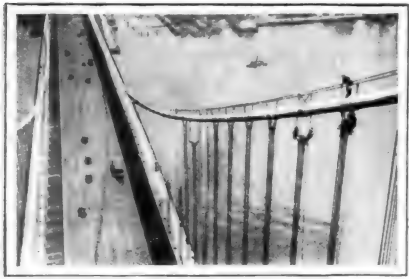
by **ROY DEAN**

Daredevils who hold down the most dangerous occupations in the world don't depend on luck to keep them alive — they're keen students who plan their stunts scientifically to put natural laws to work for them.

Billy Bomar, ace of the Howard Flying Circus, is shown above doing acrobatics on the scaffolding of the 44th story of the Hotel New Yorker. There's nothing beneath him but a two-by-four and a paved street 700 ft. below.

At left—George Garthright, a feature dancer, attracts the attention of the crowd in the street 12 stories below by walking on his hands on the roof of the Palace Theatre in New York City.

not many people realize what a huge object it is. They say that a man can



Bridges must be painted every year to preserve them. The job is a dangerous one which means death for anyone who falls.

crawl out of the statue's eye. If he should slip through that eye he would drop to certain death at the base, more than 150 feet below.

Yet Sig Smith, the man who earns his corned-beef-and by pursuing the profession of daredevil, mounted up to the top there. And blindfolded, with his eyes bandaged against the possibility of seeing a thing, he walked around on the prongs of the crown with all the carelessness of a child skipping rope.

Sig Smith has reached the ripe old age of 32, by the way. The records show that steeplejacks and stunt artists are always flirting with death and each year a number of them turn in their badges, so to speak, and go to their reward aware that no other Fate was in store for them. Theirs is a Spartan attitude. They are like the railroad engineer I spoke to during the strike on the New Haven Road several years ago when I was a reporter assigned to cover the story.

Already there had been violent outbreaks. At one point a suitcase of dynamite was found. It was no secret that the strikers meant to wreck property, trains, and human lives. At exactly midnight, just as the train was pulling out of the Back Bay station in

Every fire call means that the lives of a score or more firemen are put in danger. Falling walls, smoke and flame are taken as a matter of course by firefighters, who realize perfectly well the dangers of their job, but always accept them unquestioningly.

Boston for its run to New York, I asked the engineer how he felt about it, in the face of the reports of outbreaks.

"My job is here at the throttle. I haven't any idea whether I'll get there. But I'm going."

That is the daredevil's shibboleth. He tries beforehand to be prepared for all emergencies. His instruments are kept as near perfect as possible. But there is no safeguard against the unexpected.

There was the case of Diver Francis Smith, one of the chief aids to Commander Edward Ellsberg, who directed the raising of the S-51. Smith was known as an intrepid diver, one of the best in the business. Equipped with a special pneumatic hose, he descended to the bottom at the scene of the S-15 sinking. He bored his way with his hose through the mud, to pave the way for fixing a chain around the hull.

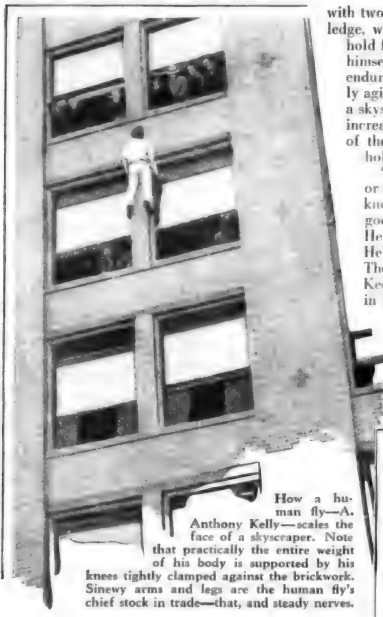
After he had burrowed his way in deep, he suddenly discovered that the opening which he had made closed in behind him. A thousand horrors gripped the heart of this veteran diver. He communicated with Commander Ellsberg, telling him of his plight. But rescue would have been impossible. He saved himself by managing to turn his back and boring his way out again in the same manner he had entered. On reaching the surface again, he asked for a cup of coffee, went down again, and this time he came up a great hero.

There are about a dozen salvage firms in New York. If that particular occupation appeals to you, you can earn from $60 to $100 a week. Or you can work piece-work and get from $3 to $5 a dive, which at the end of a week might net you a salary of $150 to $200. Pretty dangerous work, but the casualties seem few and far between. They have the diving business down to a science. Of course, the dangers are still there, however.

Firefighting has always been a spectacu-

A striking photo of a fatal leap. Norman J. Terry is shown after he left the Hudson bridge, carrying a banner to keep him in a vertical position. He struck an air pocket, twisted and landed on his back, and was killed.

The originator of this stunt of being shot from a cannon, Hugo Zygor, was killed when he missed the net after having been successfully "shot" hundreds of times. A light powder charge is used.



How a human fly—A. Anthony Kelly—scales the face of a skyscraper. Note that practically the entire weight of his body is supported by his knees tightly clamped against the brickwork. Sinewy arms and legs are the human fly's chief stock in trade—that, and steady nerves.

lar business, and the fire-laddies are mighty brave men. No day passes without some catastrophe threatening to bring them nearer to the brink of eternity. Every once in a while they tackle a harbor fire on a freighter or an oil tanker. Their water assault meets with a series of explosions which carry a death wallop.

"Human flies" represent just about the last word in dangerous occupations. No insurance company will risk a policy on these daredevils who climb up the sides of skyscrapers with no other assistance than their own hands and feet. I was talking to one of them the other day, and I asked him how he was able to go on month after month repeating his hazardous stunt.

"It's not easy," he said, "but it's simple—if you get what I mean. A human fly has to have fingers of steel. He must be able to support his entire weight with two fingers clamped over a projecting ledge, while his feet or other hand seek a hold farther on. He must be able to pull himself up with one hand. He must have endurance—staying power. Any normally agile young man can climb the face of a skyscraper for a story or so—until the increasing height gets his nerve. Most of them are built nowadays with foot-holds almost as good as a ladder.

"It's when you get up ten stories or so that your mettle is tested. You know that a slip will be fatal, but a good human fly forgets about that. He's concerned with the job in hand. He's always looking up—never down. There's sound psychology in that. Keep the mind occupied with the job in hand, and you don't have time to get scared. It's really a puzzle, climbing a skyscraper. You can chart your pathway in advance, but you can't tell what unexpected thing will wreck your plans. Usually the hardest

Despite the use of safety belts, the window washer's job remains a perilous one, for every now and then the belts slip or break. This New York window washer is working on the Graybar building.

part of the whole climb comes at the end, just when the climber is most exhausted. I refer to the overhanging coping which surrounds the top of most skyscrapers.

"The climber has to swing out and over, with nothing under him but a sidewalk a thousand feet below—has to elbow his way over the top, to edge himself finally upon the roof. It's a great game—but not for weak hearts."

"Mine's too weak, I guess," I said. "It's going pitty-pat right now, just from listening to you."

It is significant that most daredevil stunts are associated with height in some way. Perhaps that is because of the normal human sensation of vertigo which attacks most of us when we look over the top of a skyscraper. Unless you

Ewing Galloway.

Structural steel workers have no fear of height. Here is one signaling to a fellow worker hundreds of feet below, supported only by a girder around which his foot is wrapped.

are different from most folks, you've been seized with a desire to jump from the top of some building when you look down into the street below, even while the hair at the nape of your neck is curling. It's mostly your imagination, picturing to you what would happen if you *should* fall, which accounts for this feeling, scientists tell us. But it makes us appreciate the deeds of those who do defy height all the more.

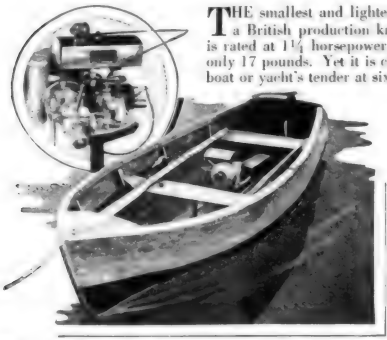
Men get used to height. Look at the steelworkers at work on a skyscraper skeleton. Watch them nonchalantly riding a huge girder while a crane lifts it hundreds of feet above the street. Height is simply a condition of the day's work to them. Fear of height is something which can be overcome with a little training.

Here's an example. If you can ride a bicycle at all, you have no difficulty in keeping it within the boundaries of an ordinary sidewalk, five or six feet wide. Yet lift that sidewalk on stilts a hundred feet in the air, and you'll not only be unable to keep the bicycle from running off—you'll be too paralyzed at the idea even to attempt it. Your ability to ride the bicycle is just the same as on the ground, but your imagination has para-

(Continued on page 172)

Movie stunt men have a high death expectancy. This photo shows Fred Osborne a moment after he had driven a motorcycle off the edge of a 200 foot cliff north of Santa Monica, Cal., wearing a parachute on his back. The 'chute failed to open and a few seconds after the photo was snapped, the motorcycle and rider had crashed into a maze of telephone wires.

17-Pound Outboard Drives Boat 6 M.P.H. on Pint of Gas



This smallest outboard motor weighs only seventeen pounds and will drive a rowboat six miles per hour on a pint of gas.

THE smallest and lightest outboard motor in the world is a British production known as the "Turner-Bray" which is rated at 1½ horsepower at 1,800 r.p.m. and weighs in all only 17 pounds. Yet it is claimed to be able to propel a rowboat or yacht's tender at six miles per hour on a consumption of under a pint of gasoline an hour.

Of the simplest design possible, the standard model is made to clamp on to the port side of a rowboat or canoe, with the shaft driving a two-bladed propeller direct, entering the water at an angle of some 45 degrees. The propeller is left-handed, which partially counteracts the tendency to turn the boat to starboard. The motor is fitted with a clutch and dog which allows it to be started in neutral, and as gears are eliminated higher efficiency is claimed than for the orthodox outboard motor, in spite of the angle of the shaft.

The single cylinder, working on the two-cycle principle, is of 1.8 in. bore by 1.9 in. stroke. The cooling water is circulated by a diaphragm pump worked by the pressure pulsations in the crankcase. The water is drawn up through a flexible tube.

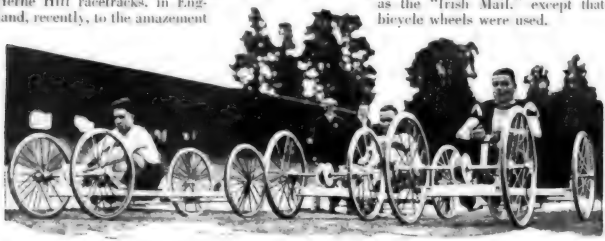
Other features of this model include a flywheel magneto totally enclosed, a needle valve carburetor, cord starting, and a detachable bronze shaft which is supplied in two lengths, 36 in. and 48 in.

British Put Ban on Skyscrapers

LONDON is determined to have no skyscrapers. Government regulations now reduce the limit of building heights, exclusive of domes, towers, etc., to a maximum of eighty feet. One reason for the ban is the fear of the stability of the London subsoil on which foundations must rest. Another reason is lack of sunlight, causing bad health.

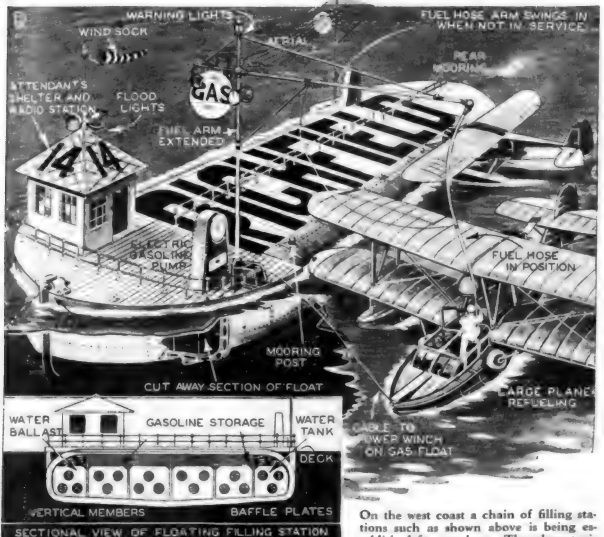
"Land Skiffs," Vehicles Like Child's Irish Mail, Race on English Tracks

STRANGE looking vehicles called "land skiffs" made their appearance at the Herne Hill racetracks, in England, recently, to the amazement of the spectators. The contrivances were built along the lines of the child's vehicle known as the "Irish Mail," except that bicycle wheels were used.



The "land skiffs," a German innovation, lining up for the race at the Herne Hill tracks, in England.

Floating Fuel Station for SEAPLANES



On the west coast a chain of filling stations such as shown above is being established for seaplanes. The plane taxis alongside, moors to the ship, and takes on gas from the fuel arm as shown.

IN THE future, when airplane travel comes to be as commonplace as automobile travel, we may expect to see floating filling stations, such as shown in the drawing above, dotting the airplane travel lanes of the Atlantic and Pacific oceans. This is by no means a fantastic project of dreamers, for already just such floating service stations are to be seen scattered along the Pacific coast; and a west coast oil company, looking to the future, has announced its intentions of establishing a chain of 99 such stations for the accommodation of planes journeying up and down the seaboard.

These floating service stations are marked by neon lighted towers and are equipped to service a plane in any way necessary, their chief function, however, being refueling. A wireless transmitter and receiver keeps the station in constant communication with land, so that weather information and emergency orders can be provided for the pilots. When a pilot wants to take on fuel he brings his ship up alongside the barge, fastens his mooring lines to the mooring post, and swings the hose, which is attached to the projecting fuel arm, into position and signals to the attendant to begin pumping.

The barge is moored in place by means of anchors. All fuel tanks are below decks, with no projection above save for the office at the stern. The fueling pumps are sunk in pits to safeguard the wings of planes moored alongside.

Toys KEEP PACE with

A typical Christmas window display of toys. Can you pick out the ones which appeal to girls, and which are the boys' favorites? Wheeled toys lead them all in popularity.

Ewing Galloway

A YOUNG father of a two-year-old youngster, noticing the eagerness of his offspring to lay hands on something with wheels on it in which he could move about, sat down one evening in his basement workshop and knocked together that simple mechanism of juvenile locomotion known to millions as the kiddie-kar. Observing the popularity of the toy with children of the neighborhood, the father concluded that it would be a good idea to manufacture the cars on a commercial scale.

He was right. It *was* a good idea—good enough to set him on the path to financial independence. Today his invention is produced by the thousands, and this Christmas Santa Claus will slide down an unguessable number of chimneys on a kiddie-kar.

That's the way the business of manufacturing toys is conducted today—on the same efficient, large-scale production methods that characterize the automobile and other industries. Nevertheless, making toys is different. You can't divest the business of all sentiment, for though dolls can be turned out by the million, the men who make them can't help remembering that each puppet of plaster and composition will some day be the well-loved toy of some little girl.

When is an article a toy? What is the appeal of toys? Do they have any effect on shaping the lives of the youngsters who own them? And what are the most popular varieties?

A recent report issued by the Bureau of the Census leaves no room for doubt as

Popularity of model airplanes and gliders proves how children follow the day's news. Sales soared after Colonel Lindbergh's famous flight.

Children's Tastes

by WAYNE MORLEY

Santa Claus isn't an old fogy—his business of manufacturing toys for good children is as up-to-date as the next minute. His 1931 model toys reflect the tempo of modern life, with wheeled vehicles, airplanes, gliders, and Paris-gowned dolls predominating. This article takes you behind the scenes of Santa Claus' great factory.

Ferdinand Strauss, well-known toy maker, examining a few of his new creations for the Christmas market. He was one of the first to make aerial toys.

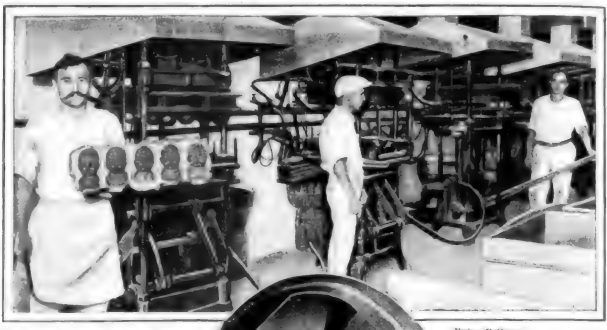
to the most popular toys. Those with wheels lead all others by a big margin. This is quite to be expected, for Young America is just as much interested in mechanical means of getting about as the older generation. Wagons, scooters, toy automobiles, velocipedes, and bicycles are "best sellers."

Dolls are always popular, but a significant feature of this part of the industry is that, although the value of manufactured dolls decreased last year, there was a substantial increase in the sale of doll clothes. This is a reflection of the keen interest of teen-age femininity in the all-important subject of dress. When the modern little girl grows up she'll know all about Paris gowns, and the art of dressing will be an open book to her.

Santa Claus' toy headquarters in America incorporates about five square blocks in the business section of New York's Gramercy Square district. For example, at 200 Fifth Avenue there are over 40 toy manufacturers, each turning out a different product. Each represents investments of thousands of dollars. Before any of these manufacturers launches a new toy on the market, he knows pretty well whether it will be popular or not, though here, as in other industries, it is impossible to predict when some toy will strike a popular fancy and develop into a fad. Witness the

Among the most popular wheeled toys are fire engines with hook and ladder.

Dolls' Heads Baked in Groups in Big Battery of "Waffle Iron" Presses



Ewing Galloway

Dolls are manufactured five at a time in the big baking machines shown above. The man at the left is holding a plaster cast of five dolls' heads which have just come out of the oven. The machines work very much like a waffle iron. Two sections with molds for the doll heads come together and press the plaster composition into the proper shape, just as a waffle iron imprints its pattern on the batter.

Here an artist is shown spraying the dolls' heads with colored paint from an air brush to simulate hair.

recent rise to fame of the yo-yo top, which proved as big a bonanza to manufacturers as the mah jong craze of well-remembered popularity.

Two years ago when Zeppelin flights stirred up the world, with the feats being glorified in pictures and in newspaper stories, Ferdinand Strauss, one of the foremost American makers of toys, seized upon the idea of turning out a toy Zeppelin. It proved the toy sensation of the year.

This last summer saw spectacular growth

in popularity of outdoor miniature golf. The craze swept over the country like wildfire. Instantly toy manufacturers designed still smaller sets for children. Santa Claus has looked these half-pint sized golf courses over and from all indications his sleighs will be bulging with them.

It is all in the psychology of the thing. Before a toy manufacturer or inventor sets forth to produce a certain article, he makes a study of the popularity of the subject after which his commodity is going to be patterned. He knows that children are inculcated with an insurmountable superiority complex.

He knows that every child, on reaching the age of rudimentary understanding, aspires to emulate heroes, performers of great deeds. It is innate, as established and as certain as the moon and sun. He knows that the ego in children asserts itself vitally in the face of other children and before their elders. The qualities of child psychology are thoroughly understood by the man who decides to invest in a certain toy, which means special factory equipment which will be useless for any other project in the event that his calculations are wrong.

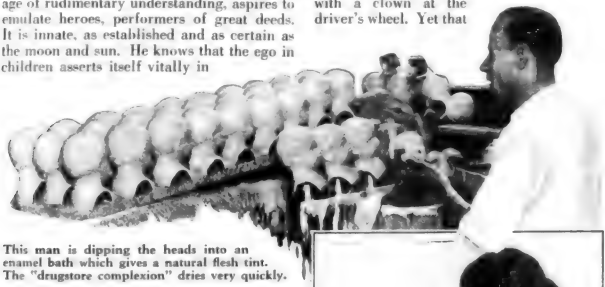
In the toy mechanical refrigerators which have been turned out by the thousands this year one sees the workings of the child's mind, attracting it to this object, rather clearly. A little girl watches her mother at work around the refrigerator. The child is baffled by its operation and yet craves to imitate her mother who is grown up and capable of handling the icebox.

Horace E. Boucher, one New York model and toy manufacturer, says:

"It is the realism which is reflected in the toy which makes it a success for the child. Without its realistic qualities it would be useless. It is only in recent months that a genuine appreciation has been felt by the toy manufacturers of the country of the lack of benefits of toys to boys.

"When a girl has gone through the cycle of her toys, she usually has a thorough course in domestic science. She has her dolls which teach her various matters about dress and hygiene. She has her toy-house which instructs her in cooking and caring for the home.

"But up to a comparatively recent day boys have been burdened with fantastic toys, adding little to their education. I cannot imagine anything more preposterous than a train with wings or an ambulance with a clown at the driver's wheel. Yet that



This man is dipping the heads into an enamel bath which gives a natural flesh tint. The "drugstore complexion" dries very quickly.

Dressing and applying the hair wig constitute the finishing operations. It is now ready for shipment.

Plaster Replicas of Amos 'n' Andy and the Fresh-Air Cab Bring $500,000

You may wonder what Amos 'n' Andy have to do with the toy business. Miniature replicas of themselves and their famous taxicab have sold to the tune of $500,000.

has been the trend of the boys' playthings. Many great men can trace their profession to toy hobbies.

"I am of the Pestalozzi school. That Swiss genius was able to combine the teaching of various principles with play. Only a short time ago I turned out one of the most unique toys of my career. The Oklahoma State Department of Health asked me to make for them a train which would illustrate the science of health.

"For the locomotive parts I had miniature tooth-brushes and tooth-paste. The boiler was made of soap. In it was water. The first car represented a loaf of bread. The second certain meats. The third illustrated certain vegetables. The last car in this line of health stood for sleep. The whole apparatus showed how a healthy program would function."

A survey of the toy industry shows that the talking pictures and their popularity brought about a big demand for miniature movie machines. The Eastman Kodak Company put Kodatoy on the market for Santa Claus and his citizens. It is a movie projector throwing pictures on its own silver screen.

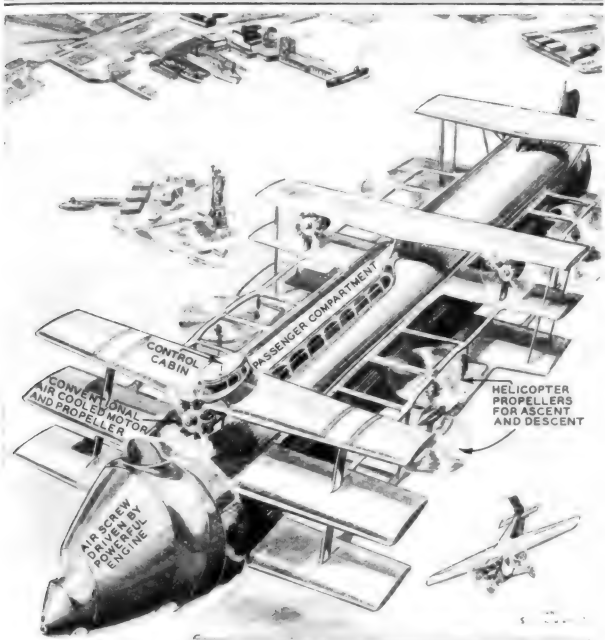
Even the radio has contributed its bit to the toy industry. Amos and Andy created a market not only for their own figures in miniature, but also of their rickety taxicab, the main asset of the Fresh Air Taxicab Company, Incorpolated. Those articles brought the toy-makers nearly $500,000.

Noise still holds a thrill for the youngster, the toy-men say. St. Nick had a big variety to choose from this year. Aside from drums and whistles, he found an assortment of twisty clicks, frog crickets, scream whistles, rattlers and the good old standby, the kazoo. Tin horns and cornets and accordions were also plentiful for the musically inclined.

Despite the inroads made by the various new toys appearing on the scene this year, Kris Kringle will find that the dolls and trains were in greatest demand. In the Gramercy Square section there was loft after loft full of these two playthings just as the Christmas spirit began to make itself felt. Even airplanes, the manufacturers' records showed, did not begin to come up to these in popularity.

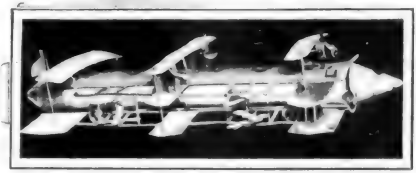
(Continued on page 184)

The FREAK of the Month ~ No. 2



An artist's conception of Mr. Knott's air liner.

THE most unusual design brought to our attention this month is the air liner invented by Mr. R. Knott of Lewisham, England, who hopes to cross the Atlantic with a ship of this type carrying 600 passengers in from 12 to 15 hours.



Here is a photograph of the model of this unusual ship which the inventor calls a heliplane. With eight horizontal propellers, the plane is supposed to be able to rise straight off the ground without any preliminary run and to land safely in almost its own length.

HUGE Race CAR to Try

ACTIVE preparations are now being made by the well-known racing drivers, Peter De Paolo and Harlan Fengler, to restore to America the world's speed record for automobiles now claimed by England and established by the late Major Segrave in 1929 at Daytona Beach, Florida. The present record stands at 231.36 miles an hour. Two Americans, Frank Lockhart and Lee Bible, have lost their lives on the sands of Daytona Beach while attempting to lower this record.

The power plants for the monster juggernaut now being built in Los Angeles are probably the most powerful unit of gasoline motors ever built. One of these motors on a dynamometer test developed 1302 horsepower at 2600 revolutions per minute.

The motors are "Triplet-eights," similar in design to the "Twin-eight" used in a well-known automobile, with an additional bank of eight cylinders mounted vertically along the center line of the crank-case — 24 cylinders in all. The bore of the cylinders is 5" and the stroke 6½", giving a total displacement in each motor of 3755 cubic inches.

Twelve carburetors supply the gas mixture—a carburetor for each two cylinders. Each cylinder has dual ignition; six distributors, twelve high-tension coils, and 48 spark plugs are utilized in the ignition of each motor.

Here is a front overhead view of the "Miss Los Angeles" as it will appear when completed. A telescopic sight will be placed between the front exhaust pipes so that the car may be "aimed."

The valve action is operated by an overhead cam-shaft similar to the war-time Liberty motors—in fact, these motors are built up with "Liberty" cylinders. To overcome torque in the long cam-shafts, they are gear-driven from both ends.

Each cylinder is fitted with an individual exhaust pipe. The accompanying photograph shows the exhaust pipes fitted to only one bank of cylinders.

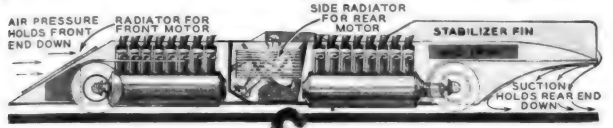
With 1300 horsepower delivered at one end of the crank-shaft, it is obvious that the shaft must be of massive design. The diameter of the main bearings is 3¾", and the shaft weighs 400 pounds.

The radiating surface of the cylinder walls is many thousands of square inches, so a huge volume of water must be circulated through the cooling system. The water pumps circulate 250 gallons a minute.

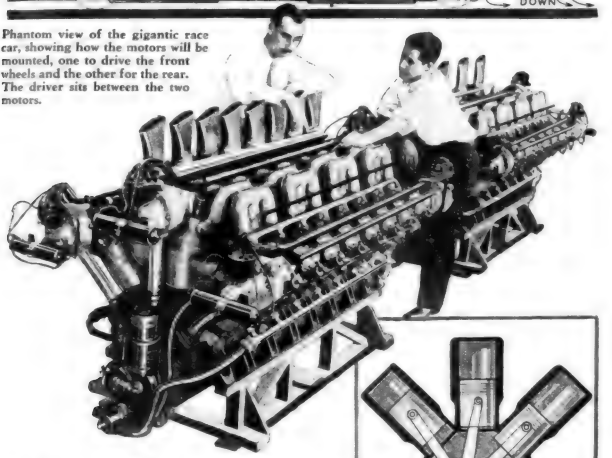
These huge motors are to be mounted in the chassis frame now being built, as shown in the sketch. One motor drives the front pair of wheels and the other the rear pair, with the driver's compartment between them. The forward motor is directly connected to the front wheels without clutch or gear-box. A clutch and gear-case with three forward speeds and reverse are interposed between the rear motor and the wheels, the forward motor being switched on after the car is in motion.

The body design dif-

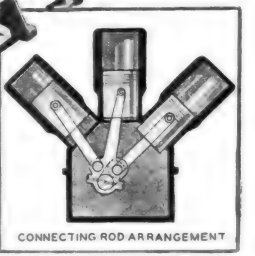
for 300 Miles an Hour Speed



Phantom view of the gigantic race car, showing how the motors will be mounted, one to drive the front wheels and the other for the rear. The driver sits between the two motors.



Here is a view of the two 24-cylinder motors which will drive the "Miss Los Angeles" at an estimated speed of 300 miles an hour. The exhaust pipes are not yet mounted on the side banks of cylinders. Each motor develops about 1300 horsepower, making them among the most powerful gas engines in the world. To the right is shown how the connecting rods are hooked to the crankshaft.



CONNECTING ROD ARRANGEMENT

fers from many other speed juggernauts in that it is not radically streamlined. Rather than seeking to reduce wind pressure to a minimum the air pressure is used to push and suck the car to the ground and provide more positive traction.

The front of the car looks like a snow-shovel tractor, the force of the air against the inclined front pushing the front end of the car down. The under side of the rear of the body is dished out, and a powerful suction is created to hold the rear end of the car down.

The gear ratio between the motors and the wheels is 1 to 1¼; in other words, the wheels turn a quarter faster than the crankshaft of the motor. At 2600 r.p.m. engine speed the wheels will turn 3250 r.p.m. Fitted with 36-inch tires, this represents a circumference velocity of 514 feet a second—350 miles an hour. In actual practice, however, the theoretical figures are cut down due to slippage. Nevertheless, the builders are confident of smashing Major Segrave's record by a wide margin—maybe 300 miles an hour.

MAKING MAGIC for

Frank Ducrot, the man behind the magicians, at his desk in his "House of Magic Wonders" in New York City.

"I know it's a trick, but who invents all of those gadgets?" you no doubt say as you watch a magician perform. This story tells you about the man who devotes his life to inventing these tricks.

"WITH your kind attention, ladies and gentlemen," says the magician as he arches his Mephistophelian brow, "I shall endeavor to perform one of the most difficult tricks of magic ever seen in this country, or anywhere else in the universe."

A tense, silent audience is spellbound. Every eye is riveted on every move the magician makes. The dimly-lighted stage adds to the enthralling mystery.

A man, who is the subject of this trick, is standing on a little table. The magician shakes the table gently to prove there are no secret appliances. He bids the man to bow to prove he is a living being.

Then, with studied pace which grips the audience still firmer, he backs ten paces away from the table, he fires a shot at the man, the lights go off for the mere fraction of a second—and the man has vanished—Thereupon the curtain drops, and a mystified house, fully aware that the magic-worker has put one over on it, is trying to fathom the workings of the final stunt in the act.

But what that particular audience and the world in general little thinks of is the man who is behind the magician who works the magic. Seldom has the creator of the magic ever been accorded the honor which was his due.

In a dingy, though highly-fascinating establishment in the Chelsea district of New York City is the birthplace of most of the magic tricks which have been in existence for nearly a half century and which have enjoyed a well-deserved popularity.

But Ducrot's "House of Magic Wonders" proves to be a house of hard work. Here he is doing a welding job on the cover of a silver vase which figures in one of his many tricks.

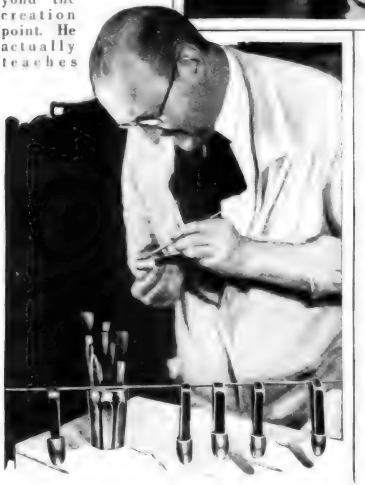
MAGICIANS

by ALFRED ALBELLI

It is there that Frank Ducrot, master mind of magic, toils zealously and quietly each day originating new gadgets, new tricks, fashioning devices for famous magicians, private individuals and occupies whatever spare moments he has with bringing new toys into being.

Frank Ducrot, who for 37 years was the advisor to Houdini, carries his cycle of magic beyond the creation point. He actually teaches magic and its operations to professional magicians and also to tyros. There is hardly a magician on the American stage today who at some time or other has not come into contact with Ducrot, to acquire either special apparatus or instruction in the manipulation of some device or article.

Trickery is usually a poor policy in business, but it's the stock in trade at this little store in the Chelsea district.



A man who is all thumbs could never be a successful magician, and yet all magicians carry these extra thumbs.

In this modern Merlin's shop there are 3,700 different items of magic, the origin of some of them dating back to the Egyptians of antiquity. It is one of the strangest and weirdest laboratories in the world. There is no mistaking it for anything else than the workshop of one who communes with the supernatural.

Frank Ducrot, although he once practiced his mystical arts with circuses, fairs and on the stage, does not fill the present-day conception of a magician. This past master might pass for the vice president of a tire company or an instructor in psychology in some college. His appearance is simple and his humor is hearty. There is nothing sly or suspicious about him. His manner is far from the racy palaver of the smooth, deceiving magician. As for his good-natured humor, it was exemplified in part while the writer was calling on him to examine the baffling

The rice trick is the creation of Ducrot and is his pet work of magic. After doubling this amount of rice he will produce a bowl of water.

mysteries of his House of Magic Wonders. We were both looking at a screen opposite us. Of course, it had been his design to attract my attention to the screen. It was blank and seemed to be made of green cloth.

"That's a pretty good invention of mine there," he said. "It's a screen which is full of cats. Could never figure how it got that way."

And suddenly a kitten appeared in the middle of the screen. There was no hole or perforation whereby the kitten had been thrust through by an accomplice.

"Just a little simple trick of my own," he remarked. "I use it sometimes when I'm giving a private show at some millionaire's home."

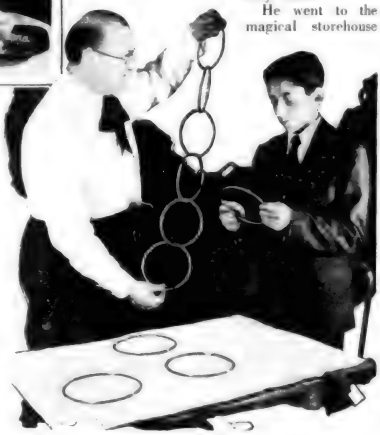
"But," he went on to say, "you've heard of the rabbit tricks. Out of hats, out of boxes, out of practically everything into which a rabbit would fit. Well, you see that basket up there on the top shelf, facing you there? You can see, can't you, that there's nothing in it? Well, just walk over there and see if you can believe your eyes."

And sure enough there was a white, pink-eyed rabbit, looking a little scared, no doubt he also wondered how in the world he ever got there.

"It's all really very simple," assured Ducrot. "It's the simple works of magic which get you. When you get a trick all complicated it does not interest you so much and neither does it work efficiently. Some time ago I had one magician crazy over a little trick I did with just a nail and a piece of string."

Ducrot started on his uncanny career of magic forty-one years ago. He recalls the day he heard that you could multiply eggs in a hat by a trick whose recipe would cost fifty cents.

He went to the magical storehouse



The magic chain trick is one with which we are all familiar, and yet is one of the most puzzling of the magician's repertoire. This is another one of Ducrot's inventions.

of the famous Martinka brothers, whose establishment he now owns, and sought to purchase the trick.

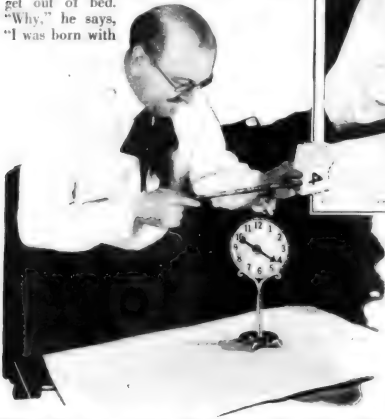
Francis Martinka, one of the most famous

makers of magic the world has ever known, handed young Ducrot a little envelope in which was sealed the knowledge he sought about the multiplication of eggs. The lad was a little surprised that he was getting just a small package for the fifty cents he had saved a week.

However, on reaching home he succeeded in executing the trick after destroying nearly a dozen eggs. That started his interest in magic, though he genially says that magic started with him the day he was able to first get out of bed.

"Why," he says, "I was born with a rabbit in one hand and nothing up my sleeves."

Here are the magic cubes, the secret of which is revealed below.

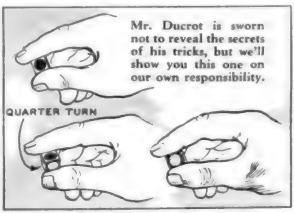


Here is the educated clock, which mysteriously points to the number indicated on the card at the command of the magician. The tablecloth prevents the use of secret wires under the table.

When he was seven years old he appeared in the historic Philip's Turn-Hall in Brooklyn and treated the audience to four stunts which he still includes in his bag of tricks today. One of them was changing wine to water and vice versa, which is popularly known as being made possible

How Magic Cubes Change Color

IF YOU'VE ever been fooled by the kaleidoscopic blocks trick you'll feel foolish when you read here how easily the feat is performed. Either one or both of the cubes are placed between the thumb and forefinger as shown on the right. You then turn over your hand to show the colors on the reverse side. Then when twisting your hand back to its original position the blocks are rolled, unnoticed by the audience, one-half turn, revealing new colors.



Mr. Ducrot is sworn not to reveal the secrets of his tricks, but we'll show you this one on our own responsibility.

Changing water to wine is one of the oldest tricks. The boy looks through the empty funnel.

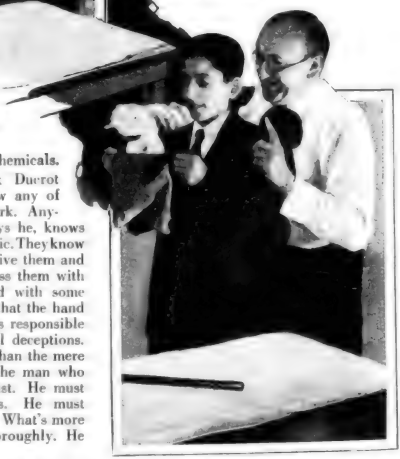
through the use of certain chemicals.

On the other hand, Frank Ducrot shies away from exposing how any of his thousand and one tricks work. Anybody with any intelligence, says he, knows that there is a trick behind the magic. They know that the magician is out to deceive them and does not sincerely try to impress them with the notion that he is endowed with some divine power. It's the old law that the hand is quicker than the eye which is responsible for the success of most magical deceptions.

Also, there is far more to it than the mere escape from sight detection. The man who creates magic must be a chemist. He must be well trained in mechanics. He must possess actual inventive genius. What's more he must know human nature thoroughly. He is a thorough psychologist.

There is no telling what hour of the day that some man, and he might be anybody from a writer of plays to a magician or a minister, and the customer will ask for apparatus to illustrate a special point, to make magic out of what is simply an idea in the stranger's mind. One day the author of "The Charlatan," a tremendous Broadway dramatic hit of several seasons ago, strolled into his shop and explained that he wanted a special cabinet. In it he intended to place a woman and she was to disappear. The idea was that the leading-man played the part of a magician. He was in love with this woman but she had been unfaithful to him. Consequently, when he placed her in this cabinet one night, he poisoned her with pins in the panels and she failed to re-appear after she had once been placed in the chamber. The magician got his vengeance.

"The phenomenon of a cabinet on a stage," said Ducrot, "was not new, but this playwright did have little twists in the action which were puzzling. Anyhow, in one week's time I gave him a cabinet which worked successfully and which kept them gazing on the Broadway stage



Pulling a live guinea pig from an empty bag is one of the old standbys. Sometimes a bowl of real live goldfish is used instead of an animal.

for over a year. Even today somebody asks me how it was done. I never tell. That is the unwritten law of all men who fabricate

magic. I don't pretend to say that the lady actually disappeared, but so far as the public was concerned, they had enough to do to dope out how she would ever come back for the next night's performance."

Next he brought forth two silver bowls. It was his pet work of magic. It was his own creation. He said it was his most popular and as yet no one outside the sphere of professional magicians has been able to penetrate to the inside of this clever bluff.

One bowl was filled to the rim with rice. Then the other bowl, which was empty, was placed snugly over it. The rice was passed from one bowl to the other. The extra bowl was removed and it was astonishing to note that the first bowl was heaped high with rice: that it had multiplied.

The process was repeated and each time more and more rice brimmed over. Finally, the two bowls were placed together again. He lifted the top bowl and again he amazingly showed that the rice was all gone and that nothing but water remained. The entire bowl was filled with water.

Claud Allister, movie star, shows how to do the multiplying billiard ball trick. After the ball is examined the shell is slipped over it unseen by the audience.

Slipping the shell off the ball reveals two balls. A wave of the hand and the shell covers the ball again, revealing only one ball. Then you find the missing ball concealed in your vest where it was planted.

This second solid ball is placed as shown and the shell again removed from the first, revealing three balls to the audience.

Another pass, the shell goes over the ball and there are two again. With a wink, you reach into your sock and recover the missing ball. This could go on forever if you didn't run out of fingers. The trick is to manipulate the shell so that the hollow side never shows. The four balls are passed out for examination while the shell is pocketed.

One of the most elaborate tricks he has ever known was that of Houdini. The great magician used to be handcuffed and imprisoned in a steel barrel which fitted him like a strait-jacket and was then lowered into a large transparent tank on the stage. He managed to extricate himself from the handcuffs and then from the tank into which he had been locked. Many writers and scientists have tried to explain how Houdini did it, said Ducrot, but the true secrets have followed the greatest of all magicians to the grave.

(Continued on page 178)

This Speedy Electrical Motor Buoy Is Aid to Life Savers

Motor buoy performing a life saving experiment at Long Beach. The buoy will support two persons.

Balloon Jumper Imitates Frog

BALLOON jumping as a sport is attracting an increasing number of devotees. Such balloons, as shown below, are carefully inflated to balance the weight of the jumper so that a slight hop will carry him many feet.

Jack Cope, above, giving a demonstration with a jumping balloon at the Curtiss Airport. This sport is becoming popular among thrill seekers.

THIS electrical motor buoy, invented and built by J. E. Haschke, of Long Beach, California, for life saving purposes, looks like a cross between the sawed-off bow of a motor boat and a freak water sled with two runners which serve as a keel. A propeller between the runners near the center of the craft is driven by a small automobile starter battery which the operator turns on or off with his left hand by means of a button switch.

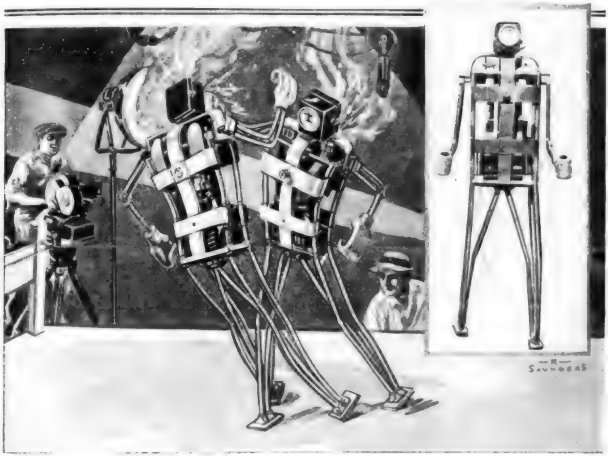
Weighing only 75 pounds, it is said that this easily guided motor buoy will tow a life saver, hanging to a handlebar across the stern, through a choppy sea at a speed of 500 yards a minute. The life saver, hanging to the handlebar with his left hand, has his right arm free for rescue service and cannot be gripped and dragged down by the drowning person.

Lock Responds Only to Code

THOSE who depend upon skeleton keys and jimmies to open resisting doors will find such instruments unavailable in one of the rooms of the General Electric Company where there is a door that opens only at the touch of the finger and only at a particular touch. If you don't know the formula or code you can't enter, and there's no key to let you in if you've forgotten the password.

Such a door at the outer portal of a lodge room would guarantee the exclusion of all but the initiated. The guard at the outer gate is no longer necessary. Knock correctly and the door swings open and you see welcome on the mat. Anyone who desires to limit his guests to those to whom the secret touch has been imparted, has here an automatic method of selection.

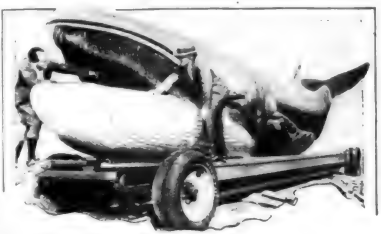
Radio Controlled Robots Stage a Realistic Boxing Match



TWO pugilistic robots, built by the Veronda brothers, of California, recently staged a furious six round boxing match in which they slugged each other's metal bodies with all the realism of a human fight. The actions of the mechanical fighters were controlled by short wave radio. At the height of the fray, however, the wires got crossed somewhere. With smoke rising from their innards the fighters lost their heads and began lashing out wildly, dealing terrific clouts with both fists. Finally one robot went down and the other collapsed on top of him.

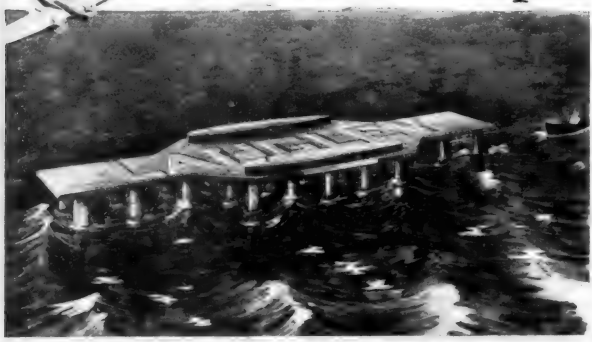
Giant Whale Makes 3000-Mile Trip Across the Country on a Trailer

PEOPLE living inland, who have never seen the ocean, to say nothing of a whale, will have the opportunity to satisfy their curiosity when this gigantic 32-foot whale, shown in the photo at the right, passes through their town on its 3000-mile overland journey from Los Angeles to New York. The great fish will be carried on a trailer, so that the curious can get a good view of its peculiarities. The whale's flesh will be treated with chemicals that will preserve it against decay.



Trailer will convey this whale across country for exhibition.

Air Liners to Europe



The seadrome, designed by Edward R. Armstrong, may solve the problem of providing safety over long water hops. The first seadrome, to be launched between New York and Bermuda, will cost $1,500,000. A chain of dromes placed every 400 miles across the ocean would provide a means of safe air transport.

Trans-Atlantic flyers are getting less and less acclaim with each successive crossing. Those who made the trip in 1930 created scarcely a ripple when compared to the sea of honors which swamped Lindbergh in 1927. This is as it should be, for it shows that the public is accepting the air as a logical medium of transportation.

THREE successful east to west crossings of the North Atlantic during the past summer of 1930 revived the old question of how soon the old and new worlds will be linked by air.

The Southern Cross hopped from Ireland to the Canadian coast, carrying four men. Coste and Bellonte in the Question Mark flew non-stop from Paris to New York, reversing Lindbergh's flight. And a Dornier Wal boat, piloted by Captain Wolfgang von Gronau, with three companions, made the trip from northern Germany to New York in a series of easy stages.

Of the three flights the last was the least spectacular and the most important. In fact, spectacular flights have little importance in the development of commercial aviation, except insofar as they center public attention on flying and point to its high safety factor.

The reason the von Gronau flight should take precedence over the others is because—given reasonable landing, refueling and repair facilities in Iceland, Greenland and on the Labrador coast—there are any number of ships in existence today that could operate a regular passenger, mail and express air line over the same route with a reasonable degree of regularity.

A non-stop hop across the Atlantic from New York to any of the European capitals is something to excite the imagination, but there isn't a plane in existence today that can make that trip and carry an adequate pay load, not even excepting the giant Dornier X, with its twelve Curtiss Conqueror motors. Before this appears in print the "X" may also have crossed the Atlantic, but by easy

How Soon?

by Major R. W. Schroeder

Former World's Altitude Record Holder

On Clarke's projection the great circle courses, which are the shortest distances between two points, appear as straight lines. Thus Berlin, Chicago and Mexico City are virtually on a line, and the great triangle of Chicago, Warsaw, Tokio and back to Chicago represents the nearest approach to an all land route around the world. Chicago, it will be seen, is the logical focal point for air lines from North America to Europe and Asia. This map shows the routes suggested in Major Schroeder's article, and in addition points out many of the existing airways which would serve as connecting links.

A Central Engine Room Will Control the Twelve Engines of the DO-X

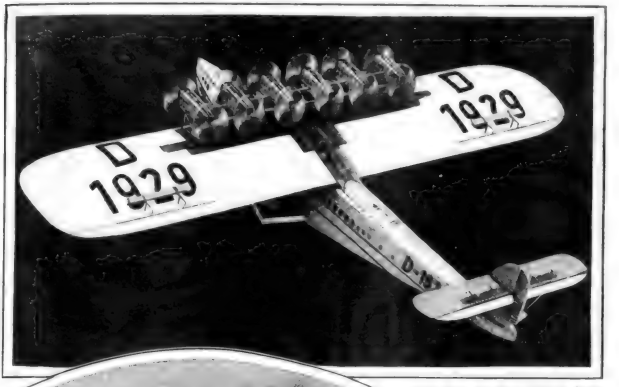
The central engine control room of the DO-X. From this station the speed of the 12 engines is regulated.

stages from Germany to Portugal, to the Azores, Bermuda and New York. And even to make that hop, from Lisbon to the Azores and the Azores to Bermuda, it was necessary to remove a large part of the passenger carrying facilities of this aerial giant, which has carried 170 people into the air and is regularly fitted with seats for seventy, and substitute extra gas and oil tanks.

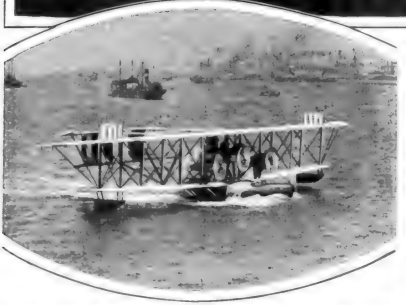
The "X" is a marvelous creation for the work for which it was built, carrying a large pay load on comparatively short hops of around 600 miles, such as an air line from New York to Bermuda. But beyond that distance the gas consumption of its twelve great motors requires such a sacrifice of pay load space as to render its operation impractical.

First Officer Merz is shown at the wheel of the giant seaplane.

That is why the route blazed by von Gronau, and twice attempted in the opposite direction by American planes—one a Stinson land craft and the other a Sikorsky amphibian—is attracting the attention of aviation leaders in both continents. With proper facilities along the route, and using two land planes and a flying boat or amphibian, it offers possibilities for regular operation with existing aircraft.



The huge air liner, DO-X, flying over the water in a test flight at 125 miles an hour.



How the historic NC-4 looked as it taxied over the water eleven years ago on its flight to the Azores and thence to Plymouth, England, on the first trans-Atlantic flight.

From New York to Chicago fast air liners could transport passengers, mail or express, to a flying field on the Labrador coast. Transfering there to a flying boat, the next hop would be to a sheltered harbor on the south coast of Greenland, and from there to Iceland and either the Orkney Islands or northern Scotland. Another land plane from there would connect with all the continental air lines at London, or, for northern Europe, a line could run from the Orkneys to Berlin or the Scandinavian capitals.

Nature, in laying out the land masses of the world, seems to have provided an ideal round the world route in the northern hemisphere. Few landsmen, brought up on the Mercator projections used in school geographies and other flat maps, realize its possibilities. For example, the shortest distance between Berlin and Mexico City is a line passing through Chicago. The shortest route from Chicago to Tokio is a line passing through Winnipeg, Canada and Nome, Alaska. You can prove that, if you have a globe, by taking a piece of string, holding one end at Chicago and stretching the string to Tokio.

That's what the mariner and the aerial navigator call a great circle course. A great circle is a line passing around the world and the shortest distance between any two points will be the great circle passing through both of them.

"Shorty" Cramer, who, with Bert Hassell,

"Multi-Engined Ship Less Efficient Than Single Motor Job" — Byrd

Lady Drummond Hay and Karl Von Wiegand, noted writers, in a passenger compartment on the DO-X.

attempted to fly to Europe by way of Greenland, a few years ago, and was forced down on the Greenland ice cap when they lost their way and failed to find their gas cache, hopped up to Nome in a Cessna a year or so ago and jumped over to Siberia to survey the possibilities of that air route. Even in late winter he found no obstacles to a regular air line. From the Siberian coast down to Vladivostok offers no particular obstacles, and from there to Moscow and Berlin the route has been flown many times.

This round the world northern route is mostly land, with the longest sea hop not more than 600 miles. There is a short jump across the Bering straits between Alaska and Siberia, and the sea hops from Labrador to Greenland, Iceland and Scotland.

The financial slump last year hit the newly flourishing air transport and airplane manufacturing business probably harder than any other line. And partly because of that condition airplane design has begun to lag behind the possibilities of aerial transport.

Rear Admiral Byrd, addressing the aircraft trade at the annual banquet of the National Aeronautical Association just before the Air Races at Chicago brought that point forcibly home.

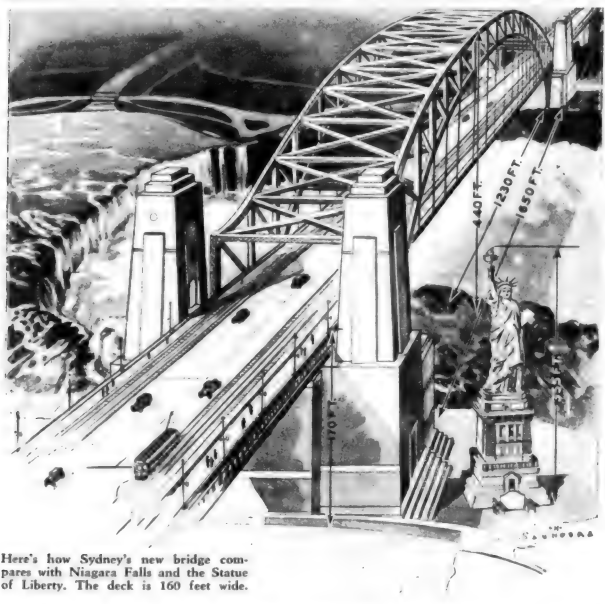
"I have been away two years," he said in effect, "and I came home from the South Pole that much behind in the development of aviation. But I found most of the air lines still using virtually the same Ford ships I flew to the North Pole three years ago and the same Fokkers I flew to the South Pole last year. In big transport ships there has been virtually no development, and, unless the manufacturer can show some reason for continuing with the present tri-motored craft, which are admittedly less than 50 per cent as efficient as a single motor job, he should seek development along some other line.

"If some manufacturer will produce a fast transport with engines in the wing and retractible landing gear, virtually a flying wing, I have a use for it right now and am ready to order the first one."

Most manufacturers of high speed planes this year have sought to cut down the drag of the landing gear by fitting streamlined "pants" over the wheels. A safe and efficient retractible landing gear would be a great step further. At the 1930 air races there were

(Continued on page 200)

Giant Bridge Spans Sydney Harbor



Here's how Sydney's new bridge compares with Niagara Falls and the Statue of Liberty. The deck is 160 feet wide.

WITH the great new single-span bridge recently completed over the harbor at Sydney, New South Wales, Australia is provided with the largest of its kind in the world. Although longer single span bridges have been erected in other parts of the world, they have all been of the suspension type.

In the drawing above the artist has given us an interesting comparison between the giant span and landmarks familiar to most Americans. The great Horseshoe Falls at Niagara could be bridged at the widest point with 420 feet to spare, while the Statue of Liberty, base and all, if placed beside the arch, would lack 85 feet of reaching the top. If Steve Brodie should attempt to repeat his famous stunt, he would have 35 feet farther to drop than when he jumped from the Brooklyn Bridge.

The arch was built out from both sides simultaneously, each half being anchored to solid rock and concrete by 128 steel cables. The two arms were fastened securely to the central pin in perfect alignment, after which the cables were removed.

The arch alone contains over 37,000 tons of steel, and the whole structure, with its approaches and giant masonry pylons, cost over $30,000,000.

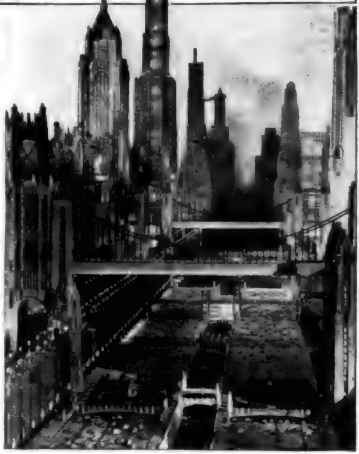
Marvelous Movie Miniatures

Nine lanes of traffic, all moving on belts, are shown on the ground level.

THE scenarist's dream of New York City in 1930 has been done in miniature at Hollywood for "Just Imagine," a motion picture fantasy. This model took five months to complete and cost approximately $200,000. It was built in an old blimp hangar once used by the U. S. Army balloon corps and covers a ground area 75x225 feet, representing the most extravagant effort yet conceived by the American cinema industry.

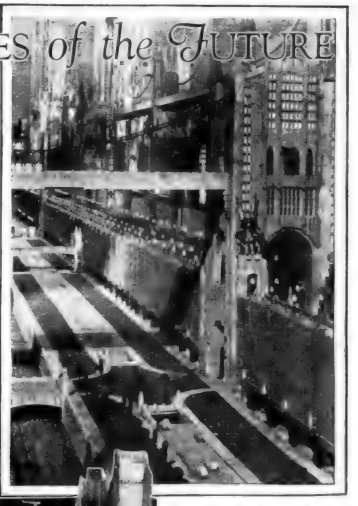
Lofty office buildings 250 stories high, canals carried overhead on suspension cables, airplanes that land on a few square feet of flat space on the side of tall structures, streets with nine lanes and nine levels of traffic, are among the interesting features. Although the model city is futuristic, its construction violates no engineering practices. It is really engineering skill carried a bit farther than today.

A crew of 200 technical experts and artisans moulded and built the miniature, which is raised on a plat-

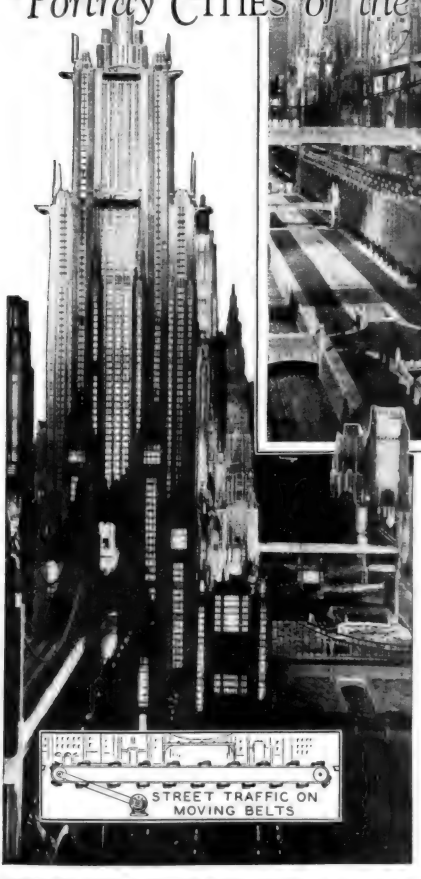


The city of the future should be a pedestrian's paradise with foot bridges crossing the traffic at each corner.

Portray CITIES of the FUTURE



The architecture is ultra modern, but not so much unlike our present American cities. Note subway at lower left.



Night in the miniature city. Note helicopter aprons on the tower.

form above the ground. More than five tons of plaster, to say nothing of hundreds of pounds of lumber, glass and other materials, were employed in this "giant" miniature, the tallest tower of which is 40 feet high — which would be close to 2000 feet in actuality. The model is built to a scale of one-fourth inch to one foot.

The utmost fidelity to truth was observed in making this set. No details of exterior construction were left undone. Even real glass was used for windows, and the plaster was colored just the same as in real structures.

Tom Thumb Golf—

by ROLAND GRAY

Midget golf, which burst on the country last summer, is more than a fad, more than a game—it's a gigantic new amusement industry which is coining millions of dollars for the men back of it. It's a living example of the power of an idea to lift a man into the multi-millionaire class overnight. This is a behind-the-scenes article on an American phenomenon which has shaken the entire amusement industry.

Walter McAdams, who started the first Tom Thumb golf course in the north, is shown examining the cottonseed hulls used for greens on courses.

WHO started driving the country goofy over golf?

What's behind that grand piece of landscape work on the corner there, dragging the customers in by the hundreds to play a vest-pocket edition of golf on what used to be an old sandlot, a handy dumping-ground for the antique tin lizzie?

Who are the men behind this 1930 Gold Rush, that has sent real estate values skyrocketing and banks hiring extra tellers?

And just one more question, if you please:

Who are the inventors and the engineers responsible for the Department of Commerce's report the other day that there is exactly $125,000,000 plunged into 50,000 dwarfed golf courses throughout the country, one of the nation's ranking industries?

People all over the country are posing these questions. Everybody is baffled by the wildfire spread of the miniature golf phenomenon. It confronts the eye everywhere, in city or country, in the mountain resorts and the seaside playgrounds. The past summer saw it rise, flamboyantly and lucratively, into an established national pastime.

Garnet Carter, father of Tom Thumb golf, built the first course back of his Lookout Mountain Hotel at Chattanooga, Tenn., where his guests testified to the fascination of the new midget game.

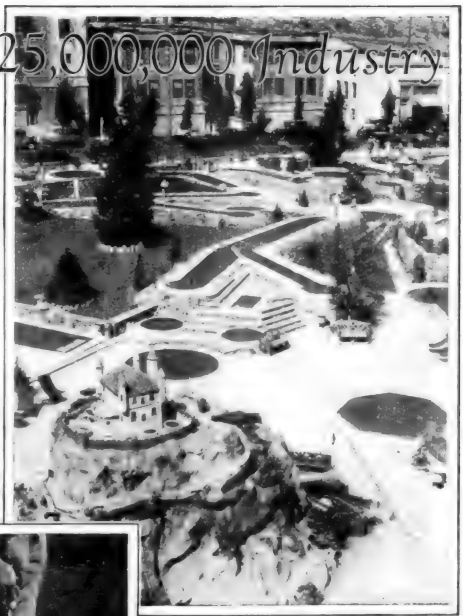
And here's the answer. Down in Chattanooga, Tenn., Garnet Carter, as genial a host as ever epitomized the hospitality of the South, began fancying a system whereby the guests at his Lookout Mountain hotel might get a little compact diversion.

Garnet Carter loved his golf fanatically. Next to sociability, a round of golf was the

A $125,000,000 Industry

next approach to happiness. Mr. Carter wasn't out for pelf, mind you. He was a wealthy man in his own right. But it was Mr. Carter's unselfish motive to impart to others the happiness which he enjoyed.

The Fairyland Golf Club which Mr. Carter operated in conjunction with his hotel cost him $300,000. It was a highly developed layout. Near the clubhouse he set up a practice putting green. Nothing very swell about it. But he just had a little extra space there, so he decided



This miniature course, the Caliente links at Los Angeles, cost $150,000. Steam arises from the castle in the foreground, and colored lights playing on the mists create a fairyland effect. There are two 18-hole courses in the layout.

Bobby Jones exemplifies correct putting stance.

to use it in this fashion. In time this little area was turned into a short pitch and putt course. It was blended with the clubhouse grounds.

The very observing Mr. Carter was surprised to find that most of the clubhouse guests tarried for rather long spells on the small pitch and putt course before going out on the major links. He noticed what a keen, insatiate interest some of the players showed in this. So one day, quite jokingly, he called his little creation his Tom Thumb course.

He started charging a fee for the use of his Tom Thumb course. This did not cut down the demand for it. It continued to grow in popu-

Tom Thumb courses are most popular at night. Elaborate floodlight systems are installed, with occasional colored lights to give a gala effect. Greens fees are usually stepped upward after six o'clock in the evening.

larity. Finally, he realized that the use of real turf on a course of this nature was an expensive proposition.

Mr. Carter spent an entire morning ruminating, trying to devise some substitute for green and living grass on his fairways. Suddenly, he thought of cotton seed hulls. He recalled boyhood days around plantations and how the cotton-raisers berated the nuisance of the cotton seed hulls. The hulls are the outer covering or the crust of the cotton boll.

The cotton seed hulls were certain to answer Mr. Carter's problem, so he started a quiet investigation, only to find that a few years previously Thomas Fairbairn, a cotton grower, of Durango, New Mexico, not far from El Paso, Texas, had already obtained a patent on cotton seed hulls for golf greens.

Fairbairn was a lover of golf, but living on an isolated plantation could not satisfy his ardor for the game. Quite by chance he noticed what a good carpet cotton seed hulls would make, that a ball would roll true on such a layer, and eventually confided his discovery to an El Paso lawyer. The latter advised him to get a patent on it, which he did. It didn't mean anything in those days, but it did when Mr. Carter hit on the same idea. It meant that Fairbairn was to be paid $100,000 outright for the patent rights.

Then last spring Mr. Carter organized the Fairyland Manufacturing Company to build his Tom Thumb miniature golf courses. Instantly he was swamped with orders. The demand was beyond his wildest dreams—though he did vision rather bountiful returns on his investment.

This picture is printed to give big course golfers, traditionally scornful of the pee-wee links, an opportunity to make scathing observations on the relative ability of chimpanzees and human beings to play the game. The trick hazards suggest croquet.

Mr. Carter, it was quite evident, was "in the dough," to use the vernacular. He was besieged with orders from every nook and cranny in the surrounding country. Then there came to him William S. Townsend and A. J. Townsend, two engineers who were the pioneer manufacturers of visible pumps. They made the gasoline station pumps where the buyer can see the flow and registering of the gasoline. They were laughed at, in the beginning, when they tried to float the nation with their product, but theirs was the last big smile when they were bought out for $2,000,000.

At the same time Walter McAdams, an associate of the Townsends, was sent around

to places where the Tom Thumb courses had been installed. Then he was sent into other sections of the country, including Florida, to make a survey of the field which might be considered for the spread of the pint-sized golf courses. Mr. McAdams had previously been engaged for similar regional studies by Henry Ford.

The Townsends completed successful negotiations with the Chattanooga hotel man. It was agreed that they would plant the Tom Thumb courses north of the Mason-Dixon line while Mr. Carter would parcel them out to the South. Thereupon the National Pipe Products Corporation, headed by the Townsends and with offices in the Chrysler Building, New York, added the Tom Thumb Golf Corporation to its holdings and created a branch in Toronto, Canada. It was this organization which supplied to the United States Department of Commerce the figures which revealed that the miniature golf course has blossomed into a $125,000,000 industry.

Walter McAdams started the first Tom Thumb course going in the North early last summer. It was a sort of experiment and feeler. It was erected in Elmhurst, Long Island. It was run day and night. In the evening playing was made possible by big floodlights. The first month netted him $1,000 in profit. The third month brought in the bonanza of $3,000 clear of expenses.

Since then the Tom Thumbers have cropped up like mushrooms. In the New York metropolitan area there were 2,000 such courses up to the middle of last September. From the Battery to the Bronx, in every space available, Tom Thumbs were appearing over-night. Coney Island and other beach resorts were speckled with them. At Asbury Park they were kept in operation until four a. m. on Sunday mornings. It was not unusual to find people in evening clothes playing a round of golf on the abbreviated fairways.

Out in Long Beach, Long Island, they got the mayor to officiate at the opening ceremonies of one of the golf courses. Atlantic City's heart went pitter-patter over them. Hollywood couldn't resist them and ultra-aristocratic and high-hat Newport just could not say "No." Its devotees ranged from near-par linksmen to duffers who couldn't tell the difference between a mashie and a plugged nickel. But everybody knew it was golf, the same kind of golf that Bobby Jones and Tommy Armour play, cut to order.

All the paraphernalia was there. The Tom

Mary Pickford owns this miniature course, built in modernistic French style. It has a large lake and lily pond featuring under-water illumination, and the "trees" scattered about add to the bizarre effect.

Thumb courses have eighteen holes, all numbered by a regular flag-tag. Although there is seldom more than fifteen yards between tees, the starting-point for a hole, and the green, where the hole is actually located, you have water hazards, hummocks, bunkers and "roughs" which can make your game both a joy and an exasperation. You also have a gallery which watches your game from behind a fence, which adds somewhat to the hazard.

Par for the complete small-course game is 42. That is considered the perfect score for 18 holes. That means that there are 12 holes for which the par is 2, meaning that you have two strokes to make each of those holes. The flag which designates the number of the hole also tells how many strokes you are entitled to. And par for the remaining 6 holes is three.

There is nothing complicated, no befuddling rules, in this game. The regulation golf ball is used and the most common golf club used is a putter, which is brought into play in the orthodox game when a ball is close to a hole.

The cottonseed hulls for the fairways are treated with special patented chemicals and are green, simulating grass. Before this one-half layer of artificial grass is laid, there is a ditch dug six inches deep. This is filled with ordinary cinders, affording a resilient cushion effect as well as a drainage for the water which seeps through in stormy weather.

The miniature golf courses, because of their sudden rise to sports eminence, have provided much food for thought for inventors, as has been evident from the securing of materials to replace the costly grass and for doping out hazards as well as the general plan of an 18-hole course. One of the most delicate tasks which engineers had to cope with was to obtain a proper calibration on angles of shots. Since par is 42, it is not utterly beyond reason, the angles and the hazards have been so compiled as to make a human goal. With the architects, machinists, woodworkers and artists who are employed in turning out each baby-golf course, and with plans underway for installing similar courses indoors for the winter golf enthusi-

An offspring of miniature golf is this "pasture pool" game, used as an auxiliary attraction at some of the larger courses. The ball is teed off by using the club like a billiard cue. Hazards are chickens, cows, and similar barnyard citizens which squawk or moo, as the case may be, when the ball rolls down their throats.

asts, the Department of Commerce did not go far astray in recognizing it among the country's most thriving enterprises.

In October Garnet Carter's Lookout Mountain Tom Thumb Golf course was the setting for a national tournament. The first prize was $5,000. Just before the national tourney plans were announced, Mr. Carter received from the Townsends the balance

In the rear of the Roxy theatre in New York, where realty values are exorbitantly high, the 32-hole course shown above makes a profit for its operators. A $1000 day is not unusual.

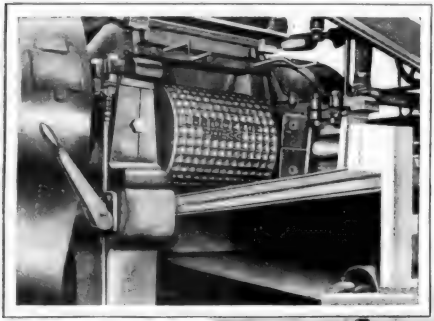
A typical Tom Thumb hole. Thousands of ingenious hazards involve the use of pipes, baffle boards, and elaborate masonry construction.

of his royalties of $1,000,000 to allow his idea of miniature golf to be installed north of the Mason-Dixon line. To one of the Townsends he wrote, by way of acknowledging the check, "Whenever you're down this way, drop around for a little Tom Thumb golf. I love the gosh-dang game."

AN OIL PAINTING for YOUR DEN!

HOW would you like to have an original oil painting of one of MODERN MECHANICS AND INVENTIONS' covers to hang in your den? It won't cost you a cent to get one—here's how: Send in an original idea for a cover painting suitable for a scientific and mechanical magazine, and if the cover editor likes it he will have it painted by a nationally known artist. After engravings have been made, the painting, autographed by the artist, will be sent to you as a reward for your suggestion. You may send in as many suggestions as you like. Ideas which win must be such as rouse the interest or pique the curiosity, but there is no restriction as to subject except that it must be suitable for a scientific and mechanical magazine. Address Cover Editor, Modern Mechanics and Inventions, Minneapolis, Minn.

Factory Converts Soft Coal Into Smokeless Anthracite



After being mixed with asphalt, the briquettes are pressed into shape by drums, as shown above.

A PLANT for the conversion of mid-continent bituminous coal into a high grade anthracite on a large commercial scale—which literally duplicates in three hours the task that it takes nature a million years to accomplish, was opened recently in Chicago. Solving a problem which scientists have been working on for more than eight years, the product promises a new era in clean, smokeless mid-western cities.

In manufacturing the briquettes, as the product is called, the long-sought low temperature carbonization process is used, which not only produces a high grade smokeless fuel for domestic use at a retail cost of three dollars a ton less than mined anthracite, but yields, in addition, large quantities of gas of high heat value.

The anthracite briquette is made from raw bituminous coal.

Thirty-five Foot Motor Boat Is Controlled Entirely by Means of Radio

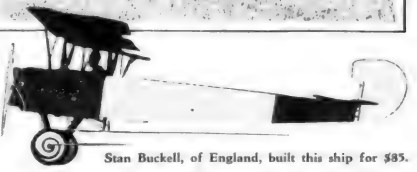
By means of radio control, this 32-foot motorboat was made to start, stop, alter speed, reverse, turn to port or starboard at will of operator at the control transmitter.

RADIO, it seems, will soon be controlling about everything controllable. The latest novelty in the line is the radio-controlled boat whose practicability was recently proved at a public demonstration at the Portsmouth navy yard, in England. The antenna was strung between four small masts, as shown in the photo at the left, while the receiver and controls were contained in a cabinet in the cockpit. From the control transmitter, which was located on a pier nearby, the 35-foot motor boat was made to start, stop, alter speed, turn to port or starboard at the will of the operator. The test was staged with the purpose of demonstrating the possibilities of radio-controlled battlewagons.

$100 for PHOTOS of your PLANE

Above is Ed Heath's parasol powered with a Bristol Cherub.

Here's a chance for light plane builders to win money to help finance the motor for their jobs.



Stan Buckell, of England, built this ship for $85.

HOW about that light plane you were thinking of building? Perhaps you have been wondering where you could find the money with which to buy the motor. Or maybe you want to take a few hours dual before taking your pride and joy in the air. Whatever your problem is, if you are a light plane fan you will want to enter this contest. Details of the contest, in which somebody will walk off with $100, appear in the box at the right.

The beauty of this contest is that it requires no extra effort: for if you are a light plane bug you are going to build a ship anyway, and of course you are going to take pictures of the job. And if you are a reader of Andy's Shop Mail Box you are going to send that inkslingin' grease monkey a picture of the crate. So taking everything into consideration, the prizes which we offer are all velvet.

There's nothing hard about it. All you have to do is to take an assortment of shots of your home-made plane, write out a short description of the job, and mail the dope to us.

Rules of the Contest

For photographs and brief description of the construction of the home-built light plane, which in the opinion of the judges shows the best workmanship and greatest ingenuity, MODERN MECHANICS AND INVENTIONS will award a prize of $100.00. For the second and third best light planes prizes of $50.00 and $25.00 respectively will be awarded. MODERN MECHANICS AND INVENTIONS reserves the right to buy any other photographs submitted at our regular rates. No photographs will be returned unless such a request is accompanied by a stamped, addressed envelope, and enclosed with the submitted photographs. In case of ties, duplicate prizes will be awarded.

Anyone may compete who is a resident of the United States or Canada except members of the staff of this magazine, or their families, and holders of a Department of Commerce license above the grade of private pilot.

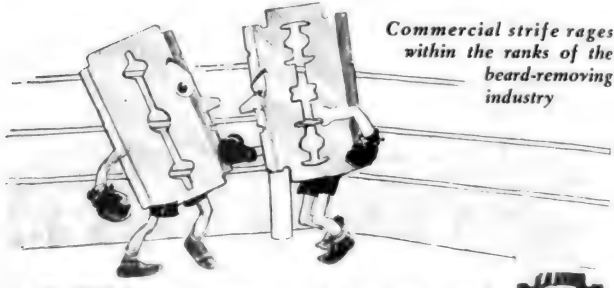
It is not necessary to buy a copy of the magazine or to be a yearly subscriber.

All photographs and descriptions should be submitted in the same envelope. Each photograph should have the sender's name and address written on the reverse side.

All entries must reach this office on or before March 1, 1931. They should be addressed to

Light Plane Editor
Modern Mechanics and Inventions
529 Seventh Street So., Minneapolis, Minn.

RAZOR BLADE *Giants*



Commercial strife rages within the ranks of the beard-removing industry

ALEXANDER the Great, so legend has it, thought rather well of himself—so well, in fact, that when marks of age began to make themselves visible on his countenance, even as with lesser men, he straightway shaved off his beard to restore his youthful appearance. And thereby started something.

Today some 31,000,000 Americans, following Alexander's example, reach for a razor every morning and cut down in its youth the beard that has accumulated during the previous 24 hours. Except for barbers and a few sturdy souls who cling to the old-fashioned straight-edge, the vast majority of these shavers use a safety razor—which means a sweetly profitable business for manufacturers of blades.

King C. Gillette, in 1901, invented the safety razor and changed the world's shaving habits. He brought dad's shaving mug from the corner barber shop into the home bathroom, and for 30-odd years the company he founded has dominated the beard-removing industry. But now new and lusty competition has arisen, following the expiration of certain Gillette patents, and a battle royal is being waged for the tremendous razor blade market.

In one corner stands the Gillette company; in the other Auto Strop, manufacturer of the Probak blade. The gong rang last March when Gillette, with an expenditure of $4,000,000 for advertising, announced a new blade distinguished by a cut-out center designed to fit a new razor. Soon it was whispered that the patent position of the Gillette company was not sound, and to put an end to these rumors the company publicly invited suits to establish the validity of its claims.

The Probak blade. Its makers claim the center holes are infringed on by Gillette.

Auto Strop obliged by filing suit in the Delaware courts, charging that the Gillette blade infringed on the Probak patent for a cut-out center. Gillette's answer alleged that the Probak patent adopted devices already known and used—and there the matter stands at present. Wall Street rumor has it that the Auto Strop company is fighting its way toward a merger with Gillette on highly advantageous terms.

Vigorous advertising methods, intensive merchandising, and a good product are credited with making Probak the formidable contender that it is. Gillette is by long odds the dominant factor in the industry, doing 75% of the world's business in past years. Gillette's net earnings in 1929 were $13,581,683; Auto Strop's, $1,065,035.

Ingenious sales methods are used both by Gillette and its rivals. It is highly profitable for a manufacturer to sell safety razors below cost of production, or even to give them away, since the profits lie in the sale of blades to fill

Battle for SUPREMACY

What brand of razor and blade do you prefer for your morning shave? Maybe you aren't aware of it, but your decision as to the blade you use is helping to decide a stirring merchandise battle for control of the razor blade market. The business of removing whiskers is a big-money industry, and Gillette, long dominant in the safety-razor field, is battling a host of aggressive competitors to retain the lion's share.

King C. Gillette—safety razor inventor—whisker victor—face in every bathroom.

The Gillette blade, subject of a patent infringement suit by Probak.

the holders. Gillette's latest coup is to give a new razor with one blade free with each tube of shaving cream of certain brands. Nominally the value of the razor alone is $1; in combination with the tube of shaving cream it brings 35 cents. Ten million of this combination were sold in three months in 27 states.

King C. Gillette, founder of the company, has turned most of the management details over to younger officials. But his picture, appearing on every package of blades, is said to be the only portrait of an individual which can be found in every city, town, and hamlet on the globe. And it is conceded that the world owes him a vote of thanks as the man who made shaving easy and thereby relegated sideburns, goatees, walrus mustaches, and similar hirsute eccentricities into the discard.

Every day the Gillette factories turn out 100,000 razors and 3,000,000 blades. If laid end to end (and that might be a good method of disposing of the old ones) the daily output would extend 71 miles. Metal used in the blades is a special Swedish steel, furnished by a Swedish concern in which Gillette is a heavy stockholder. The steel company has mine and smelting properties larger than the state of Rhode Island.

Marvelous machines punch out the steel into long strips, cut out the blades, poke through the holes in the center which are the bone of contention in the patent suit, and sharpen the edges. Each blade is individually inspected by men who are given a bonus for each faulty one discovered. Then they are packed and shipped out to distributors who place the product in one of the quarter-million retail outlets of the company.

There is plenty of competition for Gillette outside of Probak. The whole razor blade market became something of a free-for-all scramble for business when expired patents left Gillette unprotected. Considered second in size to Gillette is the American Safety Razor company, manufacturer of Gem, Star, and Ever-Ready blades and razors. Gem has an extensive billboard and newspaper advertising campaign under way to introduce the Micromatic razor, designed to hold Gem blades and no others, and thus assure all renewal business coming to the Gem company. Other makes which have their staunch adherents are Schick, Durham Duplex, Dunhill, Rolls and others.

SCIENCE Still Seeks a

by

RAYMOND HULBERT

A fortune awaits the inventor of a rain-making machine which really works. Science says there's nothing impossible about such a machine. Last summer's drouth emphasizes the economic value of a mechanism which would produce water for growing crops when needed.

SCIENCE does not proscribe rain-makers. It does not commit itself on the subject of artificial rain. Science does not say anything is impossible. But during the past century, science has shot dark clouds through the lives of men who professed to possess the talents and the instruments to cause rain to fall from the heavens.

There are incidents noted where some scientists, or perhaps a pseudo-scientist, actually succeeded in making rain fall while the skies were under the spell and influence of his apparatus. The slightest atom of a doubt persisted, however, on these occasions and therefore these inventors have never been honored with bona-fide glory. Their feats have been ascribed to the quirks of chance and coincidence.

On the other hand, engineers and scientists have not utterly abandoned their efforts to produce a machine which will manufacture rain. The drought of last summer, which was grimly devastating in the Corn Belt and other agricultural regions, revealed the golden prospects awaiting the inventor of a practical machine for rain-storms.

The latest episode where a scientist tried to bring rain out of a clear sky occurred at

Dr. G. A. I. M. Sykes with part of his electrical equipment which failed to produce rain in a crisis.

the famous Belmont Race Track during the middle of last September. Dr. G. A. I. M. Sykes installed a shed and his bizarre electrical apparatus in the vicinity of the eighth pole at the track and told the world that he would turn on the rain whenever it pleased his whims.

But before Dr. Sykes announced there was going to be rain, he came out and told Joseph E. Widener, head of the race-track association, that he would have fair weather every day of a certain week. That Dr. Sykes' weather control apparatus would keep the sun shined up like a new penny, as he put it.

When the skeptics hissed and hooted, Dr. Sykes drew forth a roll of thousand-dollar bills and asserted that he would pay a penalty of $2,000 for each day it rained against his will. Joe Widener, owner of a fine stable of horses and a sportsman to the core, offered

Rain-Making Machine

the artificial weatherman $1,000 for each day of fine weather and $2,500 each for two perfect Saturdays.

In making this bargain, Widener recalled the lamentable circumstances of June 3 at the Belmont track when 25,000 spectators were uncomfortably and dangerously huddled in the grandstand while the rain poured down during the Belmont Stakes event. Dr. Sykes took the order and went out to work for sunshine.

Dr. Sykes gave them sunshine for every day except one of that week, tucking away $8,000 in his jeans on Saturday. That's the fair side of the story, but it so happened that a sprinkle sneaked through the ozone on the final Satur-

Experimenters leased this abandoned oil derrick at Huntingdon, Calif., and erected a Tesla coil in the tower at the top, to produce rain by the discharge of high tension currents. The effort was unsuccessful.

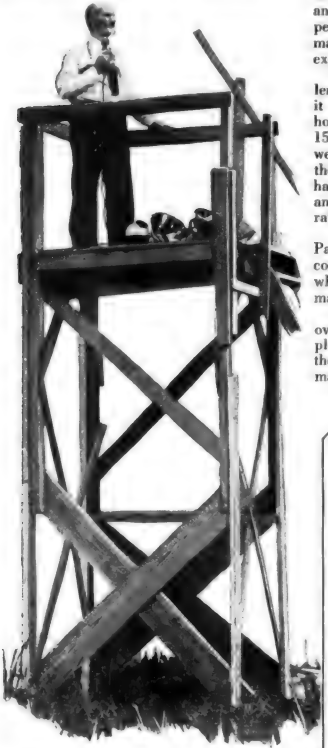
day, which was the Futurity Day and one which the Widener coterie particularly wanted resplendent with sunshine. Anyway, Dr. Sykes had the consummate satisfaction of saying he found a way to beat the horses.

But, as has already been indicated, there were squawkers and doubting Thomases who sent up a yelp that statistics for five years showed that the month of September had an average of nine days of rain over that period, that Dr. Sykes was no scientist or magician. He was just a lucky devil, as they expressed it.

Dr. Sykes graciously accepted the challenge of these scoffers and announced that it would rain at Belmont Park between the hours of two and four on Monday, September 15. His solemn pronouncement struck a weird feeling into his listeners, not unlike the sensation that Indian tribesmen must have felt when the Medicine Man, pointing an ominous finger skyward, mumbled that rain would fall at his command.

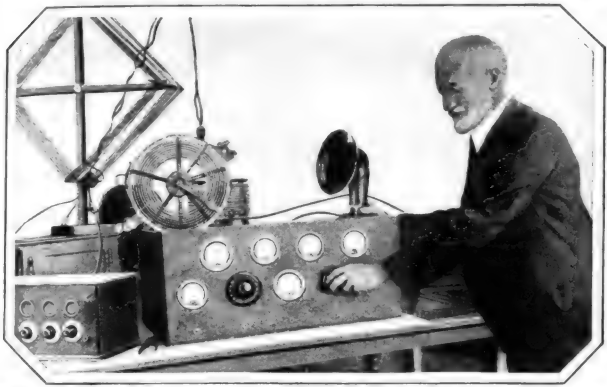
At any rate, Dr. Sykes got out to Belmont Park bright and early that morning with his corps of assistants. He set up his apparatus which he explained worked through thermo-magnetic field impulses.

"I merely assemble rain-bearing clouds over a specified area," said Dr. Sykes, explaining his intricate rain machine, "and then I turn my engines on them. The earth's magnetic field fairly eats out of my hand."



Dr. Sykes watching for rain which didn't come on command. At right is shown electrified sand being discharged from a hopper beneath an airplane in the hope of dispersing fog and causing rain. Wilber Bancroft and Francis Warren conducted this experiment with mediocre success at Wright Field, Ohio.

Two Radio Sets, Loop Antenna, Coils of Wire, Used in This Rain Machine



Dr. Sykes' central rain-making apparatus consisted of four dry cells, an electric heater, two old-fashioned radio sets, coils of wire, a loop aerial, a vase which he called a sun accumulator and an airplane prop.

Dr. Sykes soared into a profound discussion on dynurgy, xurgy, psychurgy, freenurgy, chemurgy, themurgy and several other "urgies" not in the dictionary, but since these "urgies" do not promise to become an integral part of science, they might be discarded without injury to either Dr. Sykes or science.

Dr. Sykes' central apparatus consisted of four dry batteries, an electric heater that had seen better days but which served its purpose still, two old-fashioned radio sets, coils and coils of wire and an abused loop aerial.

Added to this grotesque composition was a vase, which might have been used in the old days as a container for flowers in a steam-driven automobile. Dr. Sykes explained that this was his sun accumulator. Then there was a small airplane propeller attached to some mechanism which he said serves as wind distributor. Homely, improvised apparatus, but Dr. Sykes had an explanation for every molecule of metal there.

At a little distance from this machinery was the five-sided shed, decked out with additional aerials. Inside was a French telephone circuit which represented the negative end of the works when the other extreme was positive, and vice versa. On the wall of the shed was a map showing the magnetic inclination or the so-called "dip" for the particular vicinity. This section was in the 72d degree of magnetic powers.

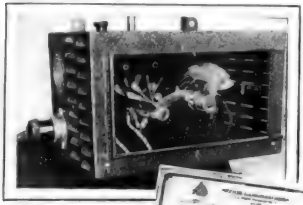
Came Monday afternoon. Two p. m. A goodly crowd was there. Dr. Sykes appeared in a full bloom of confidence. He held a hand electric generator whose function he refused to explain under these particular circumstances. Three p. m. The sun revelled high and bright in heaven.

Four p. m. Dr. Sykes mounted a platform and looked mournfully though hopefully toward the west. At four-thirty he turned to his assistant and muttered, "Into each life a little rain must fall." By five o'clock it was plain that Dr. Sykes was facing failure. Not a single drop of rain, though there were stubborn clouds everywhere. By six o'clock, Dr. Sykes had mysteriously vanished. However, not without the high commendation of his admirers. Dr. Sykes had dared to pursue the courage of his convictions.

Perhaps one of the most ambitious attempts to produce rain was that of Prof. Wilber D. Bancroft, professor of physical chemistry at Cornell University, and L. Francis Warren, another scientist. Back in February, 1923, they tried to dispel clouds and fogs

(Continued on page 138)

Ultra-Violet Ray Device Detects Alteration of Checks



Any tampering with checks, which have previously been chemically treated by a special process, is instantly revealed when they are placed under the ultra-violet rays of this protector. Two views of the same check are shown at right, the bottom one viewed through the machine.

IN THE near future a person who indorses a check which has been tampered with will be signing his own warrant for arrest, and will find himself automatically in the hands of the law, if the new ultra-violet ray protective system is adopted by banks. A bank needs only to have its checks printed on paper treated with a certain chemical which is invisible on paper, and to install the ultra violet ray producing apparatus, shown in the photo at the left, beneath its counters.

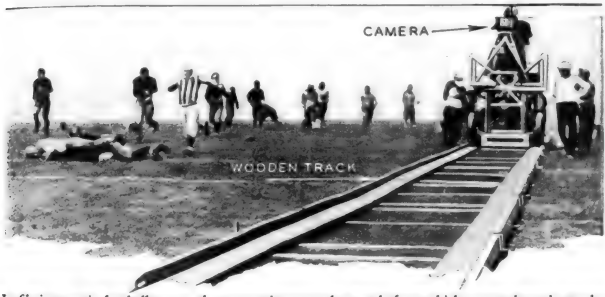
The moment a check made with the paper so prepared is presented at the teller's window, the clerk places it before the ultra-violet ray tube which produces a fluoresence that makes genuine figures stand out brilliantly, and at the same time makes any alteration in figures, erasures, or other signs of tampering show up as dark spots.

Ground Glider Teaches Prospective Flyers Method of Handling Controls

IN ORDER to remove the danger in the initial lessons in glider flying, Mr. Paul Chamberlain, a Los Angeles aviation enthusiast, has devised a ground glider which can be used in teaching beginners how to handle the glider controls, without endangering their lives. This stationary glider sets on top of a ten-foot pole and is made flexible by means of ball-bearing mountings. Having all the controls of a regular glider, it permits the prospective flyer to familiarize himself thoroughly with the method of handling them before actually taking to the air.

This stationary glider, set atop a ten-foot pole on ball bearing mountings, has all the controls of a regular glider, and is used to instruct beginners in the method of handling gliders while in the air.

Movie Football Game Filmed From Platform on Tracks



In filming movie football scenes, the camera is mounted on a platform which moves along the tracks.

WHEN watching a football scene on the silver screen, you may wonder how a camera can be moved fast enough to keep in its range of vision the rapid movements of the players. To Hollywood cameramen, however, the accomplishment of the stunt is simple enough. They simply build a wooden track, such as shown in the photo above, to act as a rail for the moving platform on which the camera is mounted. By this means the camera can be shifted quickly from one part of the field to another, or follow the dash of a player down the gridiron. The motive power for the platform is furnished by an electric motor whose speed is governed by a rheostat operated by the cameraman.

Radio-Phonograph Records Voice

The voice is recorded by speaking into the mike.

THE making of phonograph records was in the old days confined to the factories of the phonograph companies. Now, however, it is possible to make records in the home, on your own phonograph. The device by means of which this is accomplished is quite a complicated piece of mechanism, for it also receives radio broadcast programs, which can be picked up and recorded on the record-making apparatus. When the records are made, you can then use the same device to reproduce them.

Sailors' Tow Rope Hitches Firmly

CATTLEMEN, sailors, structural workers, and others who use ropes in their business, will find a new tow-rope device, which has recently been put on the market, a great time and labor saver. The rope, shown below, is so knotted and spliced that either end can be hitched to a post in a fraction of a second. And when once attached it will never come loose—the stronger the pull, the better it holds.

When hitched to a post, this rope holds firmly.

Strange Lifting Force

Looking like an immense Zeppelin hangar floating in the sky, the gyro-airship, with an immense load-carrying capacity and tremendous speed, bids fair to put railroads out of business as freight-carriers if the hopes of its inventor are justified.

How does this airship keep aloft with neither propellers nor lifting gas? It's the strangest craft yet designed to cruise the skies and represents as far a departure from conventional types of aircraft as can be imagined. You'll find this description of the ship fascinating.

WHAT is certainly the most unique airship in the world is now under construction in the form of an experimental model in the factory of its inventor in Denver, Colorado. As depicted on these pages, the extraordinary ship will use neither propellers nor gas to keep it in the air, but will depend on a mechanism which its inventor, Edgar R. Holmes, calls the "gyradoscope".

Each horsepower of gyradoscope is expected to lift 1,000 pounds vertically in mid-air and sustain the load at any desired elevation by regulating the speed, and the inventor expects a machine weighing 2,000 pounds to lift 500 tons.

Briefly, the gyradoscope combines gyroscopic action with centrifugal force. As described in the prospectus of the company, the gyradoscope consists of two wheels rotating in opposite directions in the same plane. Each wheel has several weights, the arms of which are connected to eccentrics on each wheel, which propel the weights in opposite directions in such a way that a lifting effect is exerted when the weights are at the top point of travel.

The exact mechanism by which this effect is produced is somewhat obscure, but a model of the device already built has been bolted to the floor of a freight elevator, it is claimed, and succeeded in raising and lowering it with ease. In this test a 20-horsepower gasoline engine furnished power.

Lifting force exerted by the gyradoscope is likened to that of a ball thrown on the end of a string. The weight of the ball at the moment it draws the string taut exerts a lifting effect on a pencil or other object to which the bottom of the string may be tied. In the gyradoscope the moving weights on the wheels are analogous to the thrown ball. To a casual scrutiny the whole idea seems very much like lifting one's self by one's boot straps, but the success attained with models indicates that the inventor may be successful in developing an entirely new type of aircraft.

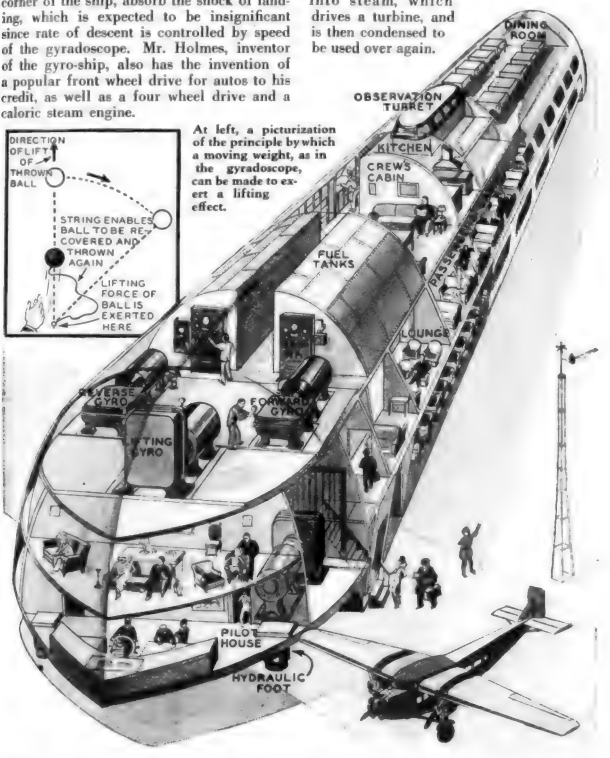
Forward motion is to be supplied by a gyradoscope in horizontal plane, and steering will be accomplished by a similar mechanism. In case of accident to the lifting gyros, which would result in the ship's dropping

Used in Novel Airship

like a plummet, auxiliary machines are provided which are kept running at idling speed ready to be called upon in an emergency. Four hydraulic landing feet, one on each corner of the ship, absorb the shock of landing, which is expected to be insignificant since rate of descent is controlled by speed of the gyradoscope. Mr. Holmes, inventor of the gyro-ship, also has the invention of a popular front wheel drive for autos to his credit, as well as a four wheel drive and a caloric steam engine.

This latter machine would supply the power for the airship. As developed by Mr. Holmes, waste heat from oil combustion is used in the caloric engine to convert water into steam, which drives a turbine, and is then condensed to be used over again.

At left, a picturization of the principle by which a moving weight, as in the gyradoscope, can be made to exert a lifting effect.



Above is a phantom view of gyro-airship, planned for production, showing arrangement of parts.

Decorate Your Home

Decorating a Christmas tree can be either a commonplace, unattractive job or a work of art. By following the suggestions in this article, you can create ornamental effects on your tree that are striking and novel.

SOON Christmas will be with us again. And along with it will come the task of bringing in a fragrant evergreen from the woods, setting it up in its holder, and beautifying its boughs with innumerable bright ornaments.

Now, decorating a Christmas tree can result in either a very commonplace job or a work of art. One of the first considerations should be the symmetry of the tree itself. Sometimes it is difficult to obtain a perfectly symmetrical tree the size one desires. However, by applying a little ingenuity, any fairly good tree can be shaped into a symmetrical cone. To do this, some extra branches are necessary. If these can not be obtained otherwise, it is well to buy a cheap, mis-shapen tree, and use its good branches to build up one well-shaped tree. Fig. 1 shows how this operation is performed.

Wherever the branches of the tree are sparse, the extra branches are used to fill in. The branch is cut to suitable length, and the bark is peeled off the end for about 1". A

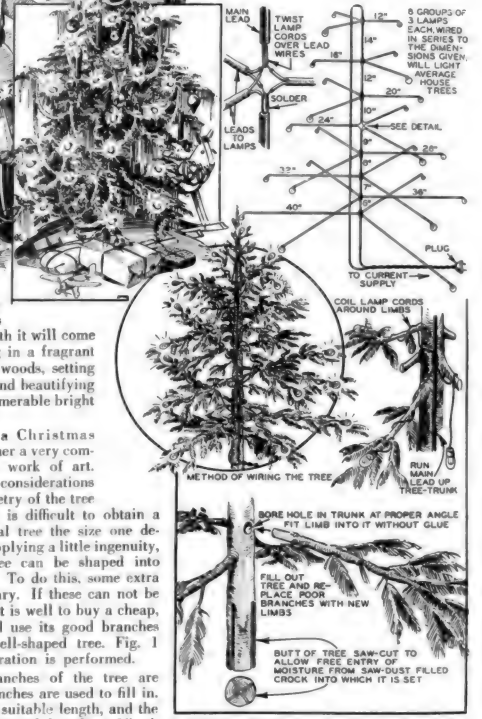


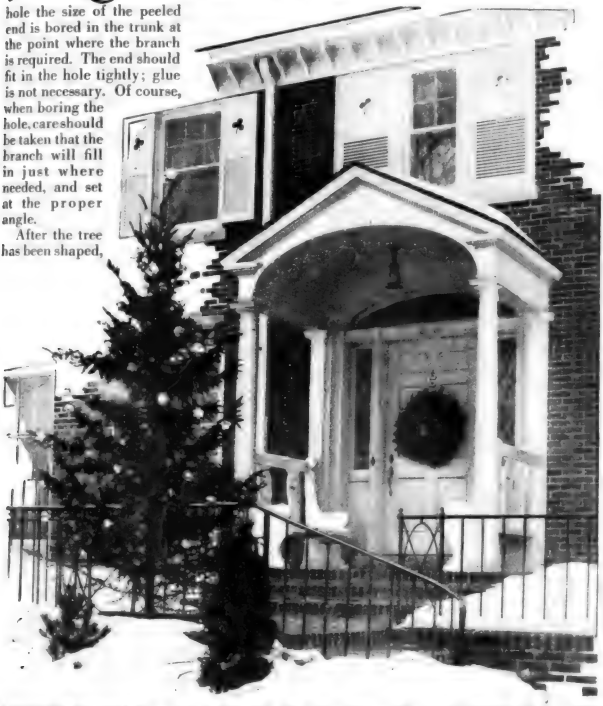
Fig. 1. Details of wiring and adding new limbs.

for CHRISTMAS

by Dick Cole

hole the size of the peeled end is bored in the trunk at the point where the branch is required. The end should fit in the hole tightly; glue is not necessary. Of course, when boring the hole, care should be taken that the branch will fill in just where needed, and set at the proper angle.

After the tree has been shaped,



A tastefully decorated tree, such as shown in the photo above, will attract attention of passers-by.

the next operation is to set it up. There are many patent stands on the market for this purpose, but the base shown in Fig. 3 will be found exceptionally satisfactory. Not only does it merely support the tree, but it serves as display rack for the presents. And, even more important, provision is made for irrigating the tree.

Everyone knows that in a heated house, particularly in one heated by a hot air furnace, a Christmas tree soon dries out and the needles fall. If continuous moisture is supplied to the butt end of the tree, it will keep alive and fresh for months. Not only will it retain its velvety, green color, but it will exhale a fragrant, woodsy odor. The

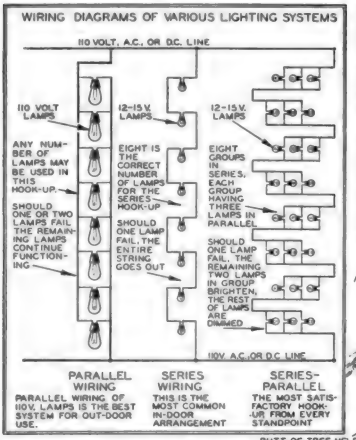


Fig. 2. Various methods of wiring up tree lights on 110 volts are given above. The series-parallel hook up eliminates nuisance of locating blown out lights.

sketch shows clearly how the irrigation is brought about by setting the tree in a crock filled with wet saw-dust and placed in the center of the stand. If a crock is not readily available, a pail will serve. The butt of the tree should be slotted with a saw to give better access to the moisture.

After the tree is set up, the next operation is to string up the Christmas tree lights. These are the bug-a-boo of many Christmas tree decorators. Everyone knows what a nuisance it is to locate a burnt out lamp on the usual Christmas tree string. This is because the lamps are wired in series, as shown in the wiring diagram in Fig. 2.

This troublesome feature can easily be remedied. It is customary to use two, three, four or more strings on a tree. By rewiring these into a system known as parallel-series wiring, an indication is given immediately a lamp burns out. It can instantly be located and replaced.

The method of applying the parallel-series wiring to three series-wired strings is shown in Figs. 1 and 2. The first thing to do is prepare the leads to the lamp sockets. These must vary in length to conform to the conical shape of the tree—shortest leads at the top; longest leads at the bottom.

After the eight sets of three leads

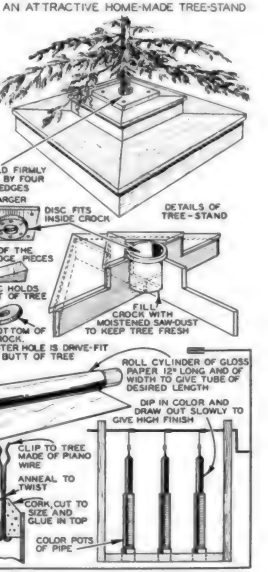


Fig. 3. Mounted in the holder shown above, a tree will retain its freshness a long time. Attractive ornaments can be made as shown in this drawing. Covered with cellophane, they gleam brightly.

have been prepared, they are hooked up as shown in Fig. 2. It is best to solder the connections. Afterwards, each joint should be taped separately and then taped together to make a nice job.

In use, the main leads follow along the trunk of the tree. The leads to the lamps are twisted loosely around the branches, as shown in Fig. 1. With the ordinary series-wired lights, the wire must be draped from branch to branch in an unsightly manner. After the strings have been wired into parallel-series, if one lamp burns out, the other two of the group will burn conspicuously brighter, while the balance of the lights on the tree burn dimmer. The contrast is so pronounced that it is instantly noticeable. Of course, the third lamp of the bright group is the bad lamp.

Parallel-series wiring can not be applied to less than three strings. Four is even better. Even though this re-wiring may take a little time, it is well worth it. The string can be used year after year. Furthermore, this wiring system balances the current in the string, and burnt out lights are very infrequent.

Indirect lighting is becoming more popular, particularly for outdoor Christmas trees in the milder climates. However, even the indoor tree is usually set up to be shared with the passer-by in the street. Indirect lighting, with variable color screens, affords the most artistic lighting effect.

Harmony of colors and symmetrical arrangements of limbs and ornaments make this Christmas tree a striking work of art.

The steps of the holder permit the gifts to be arranged neatly around the base of the tree, as shown in the photograph above.

Fig. 4 shows a simple means of providing indirect lighting. Two cylinders are made of sheet tin. Each contains a string of four 100-watt lamps. A slot in the side of the cylinder directs the light on the tree. The cylinders are set on improvised shelves at the extreme ends of the window sill.

A color screen revolves around the cylinder, as shown. Thin, colored celluloid is used. If not readily available, oiled tissue paper can be used. The celluloid—or paper—is secured between wooden embroidery hoops at the top. The "ten cent store" will provide these. The bottom of the color screen is weighted with a metal band, preferably lead. The complete screen is suspended from a screw-eye in the ceiling. Undressed, silk fish-line is recommended. To rotate, the color screen is wound up about thirty turns. It will then unwind and wind up; unwind and wind up; for hours, diffusing the tree with ever-changing colors. Since the three primary colors—yellow, red, and blue—are used on each screen, the blending of the colors of the two screens will yield every color in the spectrum. The effect is spectacularly beautiful.

The effect of indirect lighting can be enhanced by vertical high-lights reflected from the ornaments. The reflection from a highly polished cylindrical surface yields vertical high-lights. These suggest an icicle effect.

Indirect Lighting Scheme Creates Effects That Are Striking and Novel

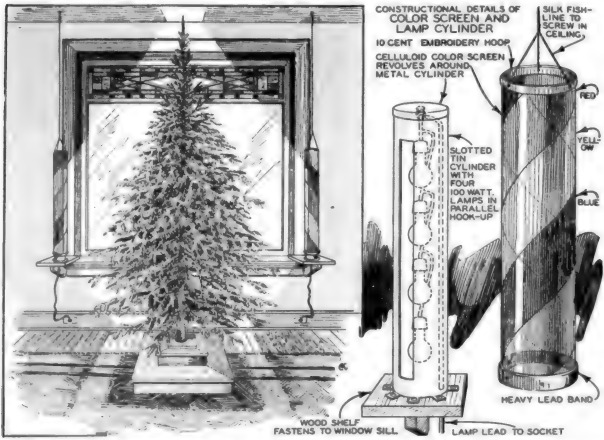


Fig. 4. Indirect lighting by the method shown above greatly enhances the beauty of a Christmas tree. The colored cylinder revolves about the lights at the side as shown to produce changing color effects.

Tubular ornaments are gaining in popularity as their purpose is better understood. However, suitable, cylindrical ornaments can be made easily by anyone. Fig. 3 shows how these can be made of paper. The essential feature is that the cylinders must have a high finish. The best way to do this is to submerge them in the paint. A good grade of enamel or color varnish should be used. To obtain a beautiful, smooth finish, the cylinders should be slowly drawn out of the paint. A simple rack can be made, as shown in one sketch, which will serve the purpose very well. In addition to the colors red, blue and green, gold and silver should be used. These can be imitated by using bronze and aluminum paint. If afterward covered with thin cellophane — the transparent wrapping of candy boxes, etc.—a glistening effect can be produced.

Additional vertical high-lights can be created by making "icicles" of thin strips of cellophane. The wrapping of candy boxes, and other articles of food, should be preserved, and cut into strips about ⅛" wide. These are hung thickly—but individually—from the branches. Under indirect lighting, the effect of these "icicles" is very unique. To create an artistically decorated tree, symmetry and color blending are more important than a mass of gew-gaws.

During the yule season, hundreds of trees are posed in the front windows of residences, but many are passed by without a second look, because they are mere, commonplace Christmas trees, laden, or perhaps overladen, with glassy ornaments. Occasionally a tree arrests attention—it fascinates the eye. It is thus not the tinsel and baubles and glamor that compels attention, but the symmetry of the tree itself, the color harmony, the lighting effect.

It is not so much brightness of ornamentation that makes a tree attractive, as harmonious color effects, an abundance of tastefully devised ornaments, and a symmetrical arrangement of the decorations.

If the foregoing suggestions are adapted, a shapely, firmly-mounted, trick-proof lighted tree will result. And the wet saw-dust will keep the tree fresh and aromatic for many days.

Your Handwriting Analyzed Free

M. N. Bunker, world famous grapho-analyst, begins this month a series of articles on handwriting analysis, and offers you a free reading of your own writing.

Do you write like either of these specimens? Mr. Bunker explains significance of these letter forms.

A MAN who blocks out his small m's and n's as shown in the signature of Charles P. Steinmetz is invariably possessed of natural talent for creative work. He may be a scientist, or a surgeon, or a painter, all of these varied fields depending upon other traits in his nature.

Also a writer who makes his m or n broad or flat across the top is a careful thinker. He does not jump at conclusions, but gathers the evidence, builds up the information to a point where he feels that he can make a final decision, and then makes it. After he has done this he is not easily changed.

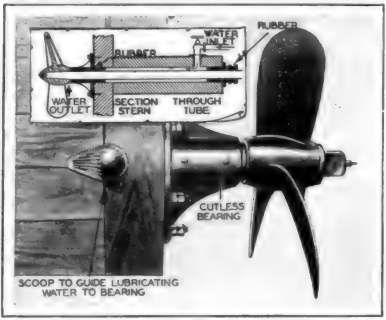
A writer who, on the other hand, writes with his m's and n's sharp-pointed like his w's and u's is not a slow and careful thinker. He reaches a conclusion almost instantly. He sizes up people on meeting them the first time. Such a writer learns readily in school, provided he is interested in a subject. If he is not interested he is likely to have an uneasy and restless nature, and does not apply himself.

There are times when we find both styles of m's and n's in a single page of writing. When this occurs it is clear evidence that the writer thinks very rapidly, forms his conclusions instantly, but that he also has the ability to go back and check up on his hastily formed conclusions.

Men and women who write with both the rounded and pointed m and n strokes are likely to adjust themselves readily to almost any field of work, because of the extent of their natural abilities. The widely rounded stroke shows the creative, and the sharp-pointed represents their ability to handle keen mental problems.

Your hidden powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, addressed envelope, together with a specimen of your writing, to M. N. Bunker, care of Modern Mechanics and Inventions, Minneapolis, Minn.

Rubber Bearings Lubricated by Water Will Cut Vibration



Noise and vibration are cut down by these motorboat bearings which are lubricated with water as illustrated above.

IF AN old time boat builder is asked what is the best material for motor boat bearings and for lubrication, he will invariably answer, in the first case, bronze, and in the second, something of an oily nature. This no longer holds good, however, for it has been discovered that good bearings can be made of ordinary rubber, and that such bearings can be lubricated just as effectively with water.

This new bearing, which is constructed as shown in the drawings at the left, was used in the *Miss England*, the boat in which the late Col. Segrave broke the world's speed record, and in the coastal motor boats of the Greek navy. The anti-frictional properties of rubber when wet make it well suited for bearings, and in addition it is a good insulator of noise and vibration.

New Asphalt Prevents Skidding

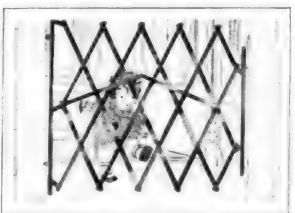
A VARIETY of asphalt containing fine powder of fossil shells, manufactured ages ago on the sea bottom by living shell-fish and now mixed by subsequent geological revolutions with the black, sticky asphalt, has been found by British engineers to make the best non-skid road surface yet discovered.

Tiniest Steam Engine ½ Inch Long

THE latest member of the world's smallest something or other club is a steam engine so tiny that it would take 2925 of them to weigh one pound. When it comes to speed, however, its size is no handicap, for it can turn over as high as fifteen thousand r.p.m. Some idea of its extreme smallness can be gained by comparing it with the 45 caliber shell on which it is mounted, as shown in the drawing at the left. The flywheel is about one-fifth inch in diameter, and its piston rod is ⅛-inch long.

Idea of engine's size can be gained by comparing it with the bullet on which it is mounted.

Folding Gate Keeps in Children



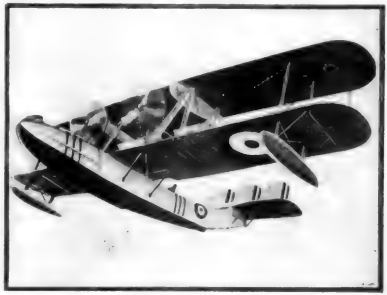
This folding metal gate can be attached anywhere to keep the children from straying away.

MOTHERS who are constantly worrying about the whereabouts of their small children will find this metal porch gate an extremely serviceable means of keeping the kids confined to the porch. The gate is provided with a spring and ring locking device and is adjustable to fit various places. Thus it can also be installed in windows that open out on porches or in doorways between rooms.

PLANE TALK

Edited by
MAJOR H. H. ARNOLD
Former Assistant Chief,
U. S. Air Corps

With a background as old as aviation itself, Major Arnold, who conducts this department, is well qualified to look into the future and speculate on probable methods of air transportation.



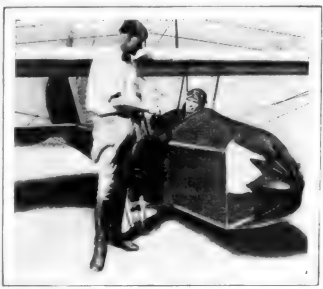
What Will Come Next—Air Trailers or Mammoth Planes?

A FEW years ago it was quite common to hear the expression, "It's a queer looking contraption but I don't think that it will fly." Today it is not a question as to whether or not it will fly for it seems as if any kind of device will fly as long as it has wings to hold it in the air and an engine to pull it or push it.

The airplane has been developed to such a point that it has now taken its place as a common carrier. Everyone expects it to be used as such and accordingly now accept, as a matter of course, feats which a few years ago would have been considered as utterly impossible. However there is a limit to all things. What is the ultimate in commercial aerial transportation?

If we go back a few years we find that there was a tendency among designers and engineers to produce large multi-motor planes for commercial operations. They were slow but could carry a big pay load. The thought prevailed that even though the planes made but 70 to 90 miles an hour the destination was reached much sooner than it would be were any other form of transportation used.

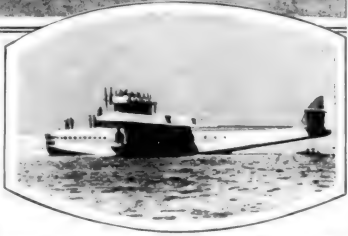
The American public demands speed. It makes no difference what use is made of the time saved, transportation must have speed or it will not be popular.



The first air-train about to start. The glider shown above, towed by a Waco, flew 160 miles in three hours.

However, speed itself will not solve the aerial transportation problem. Hawks' itinerary for his flight across the continent would have satisfied patrons whose destinations were Wichita, Indianapolis and New York where he made his stops but how about those who wished to go to such points as Chi-

America's answer to the mammoth plane problem — the Boeing Air Transport.



The world's largest plane, the Dornier X, powered with 12 Curtiss engines, has carried 160 persons on flights.

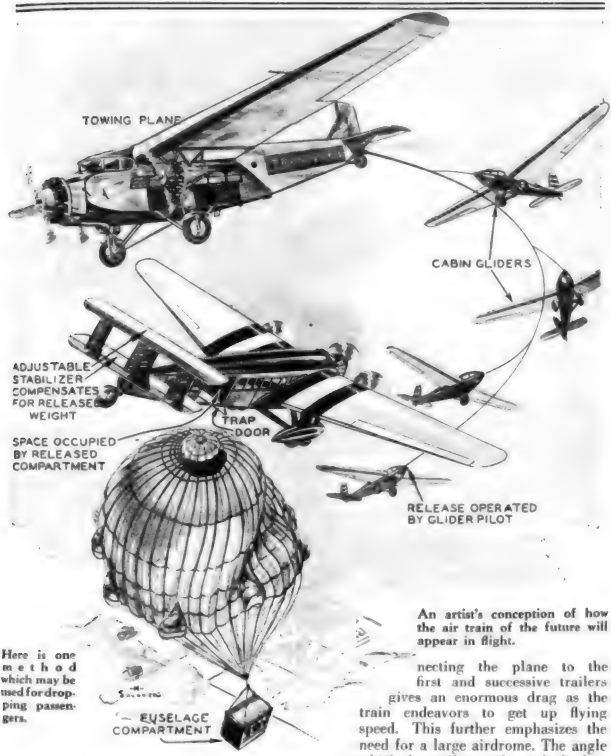
cago, St. Louis or Kansas City? Obviously on all long lines provisions must be made for branch connections and intermediate stops. However, if such stops are made the time en route is greatly increased and the demand for speed not satisfied.

What manner of aircraft then can be used to the variety of demands imposed? The through traffic requires maximum speed with a minimum number of intermediate stops. However, there probably will be as much income from the intermediate traffic, that with points of origin and destinations between the ends of the line. The first thought which comes to mind is a large number of air-liners each with a different destination. Certainly by this means all airports and branch lines could be served. However, the expense would be terrific. Another solution is to put into effect the idea advanced by Anthony Fokker several years ago—a towing plane with air trailers.

It has not been so very long since Hawks traveled across the United States in an air trailer. The elapsed time was rather long but the practicability of the trailer was demonstrated. Fokker advanced the idea that several trailers could be pulled by a single towing plane. As a matter of fact there are people working along that line at this time. Accordingly perhaps we will some day see a towing plane with several air trailers flying along the route from say, St. Louis to Cleveland. When the aerial train arrives over the airport at Indianapolis, a trailer will be uncoupled and brought to earth by its pilot. Similarly other trailers will deliver their cargoes to Dayton, Columbus and any other point en route where a pay load makes it worth while.

Another method of securing the same service would be to have large cargo planes with parachutes attached to light weight platforms. When the destination for cargo or passengers was reached, the steward, after loading up the platform, could pull the lever which would allow the parachute to deliver its load. The cabin of the large plane would have to be so constructed that these parachutes with their platforms could be set up during flight. Perhaps an additional cabin would solve the problem as all arrangements could be made without discomfort to other passengers or making a rearrangement of the cargo necessary. An opening in the floor the size of platform with a trap door to shut when not in use would fill the bill. When approaching the destination the steward might call out, "Passengers for Columbus please move forward to the shuttle 'chute." Then baggage, passengers and any express would be attached to the platform and the 'chute dropped. It sounds rather far fetched at this stage of

Two Likely Methods of Discharging Passengers at Intermediate Stations



An artist's conception of how the air train of the future will appear in flight.

Here is one method which may be used for dropping passengers.

aircraft development but passing years change many things.

It is quite easy to picture a towing plane with its trailers taking the air but things look different when plans are made for its accomplishment. The train must of necessity be rather long and thus requires a very large airdrome. The various cables connecting the plane to the first and successive trailers gives an enormous drag as the train endeavors to get up flying speed. This further emphasizes the need for a large airdrome. The angle which the trailers make with the line of travel differs while running along the ground from that taken when traveling through the air. This could be taken care of by a system of bridles attaching the trailers to a main cable.

The problem becomes simpler when the train is in the air. The pilots of the trailers then have a steady pull to take care of.

Elaborate Equipment Is Required for an Altitude Flight

Two airmen ready for high-altitude photography. Note how the gloves are attached to the flying suit so that they will not get lost if removed.

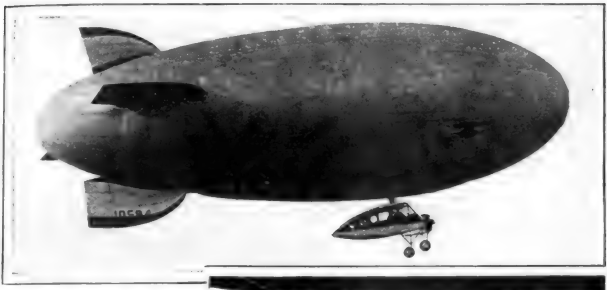
FROM their looks it would be rather hard to figure out just what these two men had in mind when they put on their strange clothing and assembled the odd looking equipment in the foreground. The face masks bear a striking resemblance to the generally accepted, fictitious "Men of Mars." The metal devices in front might well be oil stoves. However, our assumptions are all wrong as the picture shows two aviators about to start on a high altitude flight.

There are two great dangers to be guarded against during high altitude flights—extreme cold and insufficient oxygen in the rarefied air. The temperature falls rapidly as the aviator gains altitude until a minimum of about 70 degrees below zero Fahrenheit is reached. Present indications are that, regardless of the altitude attained, the temperature will not drop below that minimum. Accordingly the airmen wear several suits of clothing, sweaters, fur lined flying suits, gloves and face masks when engaging on flights above 20,000 feet. The leather furlined suits and gloves can be seen in the picture.

Experience has taught that lack of oxygen means unconsciousness for the aviators. In the picture the oxygen tanks are standing on the table in front of the airmen. The face masks are fitted with tubes for attachment to the outlet pipes from the tanks. The aviator can regulate the amount of oxygen that he gets through a valve attachment. Each of the aviators has his own oxygen supply which minimizes possible trouble from that source. These two men were about to climb to an altitude of 30,000 feet for the purpose of taking photographs.

Lieut. Apollo Soucek pointing out his oxygen supply tank.

A Flivver Blimp for $10,000



Riding with majestic ease over the hangar at Cape May, here is the new "Flivver Blimp."

CAPTAIN Anton Heinan, veteran dirigible pilot and the man who supervised the construction of the ill-fated navy dirigible *Shenandoah*, has recently completed the first of a fleet of small dirigibles for the use of sportsmen and business men.

These small airships, which will cost $10,000, can carry four persons, including the pilot, in the mahogany gondola. A six-cylinder radial air-cooled motor is used for the power plant developing speed in excess of 60 miles an hour. Later it is expected that a control car will be developed which will be detachable and may be run on the ground as an automobile.

Captain Anton Heinan at the controls of his new blimp which he will shortly manufacture on a commercial scale.

Hydrogen was used in the first ship, although future air-yachts may be filled with helium if the owner prefers, in which case the envelope will be enlarged, with slightly greater cost. The present envelope is 104 feet in length.

Recent test flights over Cape May, New Jersey, revealed extraordinary ease of handling. No ground crew was required in taking off or landing, and during a test the pilot alone anchored the ship in 46 seconds. The landing wheels are placed on swivels.

Flexible Wood Cut With Shears

REAL wood which can be cut with scissors and bent almost double without breaking is announced by the Industrial Bulletin. It is made by cutting a thin veneer, 1/60th to 1/120th inch in thickness, which is glued to a paper or cloth backing; after being dried it is flexed by a mechanical process.

This wood may be applied to walls by paperhangers and finished with sandpaper, shellac and wax. Although the decorative features and economy of thin veneers have been known and used for many years, it is only recently that they have been made available on a large scale. The new product may also be applied to plaster, wall board, and cheaper grades of wood.

Divers Brave 400 Ft.

New methods of salvaging sunken treasure are being employed by Italian divers who hope to recover $5,000,000 worth of gold bullion from a sunken liner 400 feet beneath the surface—a depth at which it was once regarded as impossible to send a diver.

Proof that treasure can be recovered from 400 feet down is afforded by the above photo of the captain's safe of the Egypt, snapped just as it was hauled from the bottom. The boat used in the salvaging operations is the Artiglio, manned by Italian divers.

LURED on by the challenge of one of the oldest adventures known to daring men—the quest for lost or hidden gold—a group of Italian divers located the Peninsular and Oriental liner *Egypt* last September a little over 400 feet beneath the surface of the ocean. She was found off the coast of Brest, France. In her hull reposed $5,000,000 in gold.

The *Egypt* went down eight years ago when she collided with the French tramp freighter, the *Seine*. She was given up for good until the crew of the Italian salvage boat, the *Artiglio*, appeared in the waters near Brest last summer with equipment intended for the recovery of the $5,000,000 and other treasure which their grappling irons might capture.

After several weeks of underseas searching, the *Egypt* was finally located 1,000 feet distant from the spot where the salvagers had calculated that she would be. The builder's designs guided them in their work once they established the position in which she was lying.

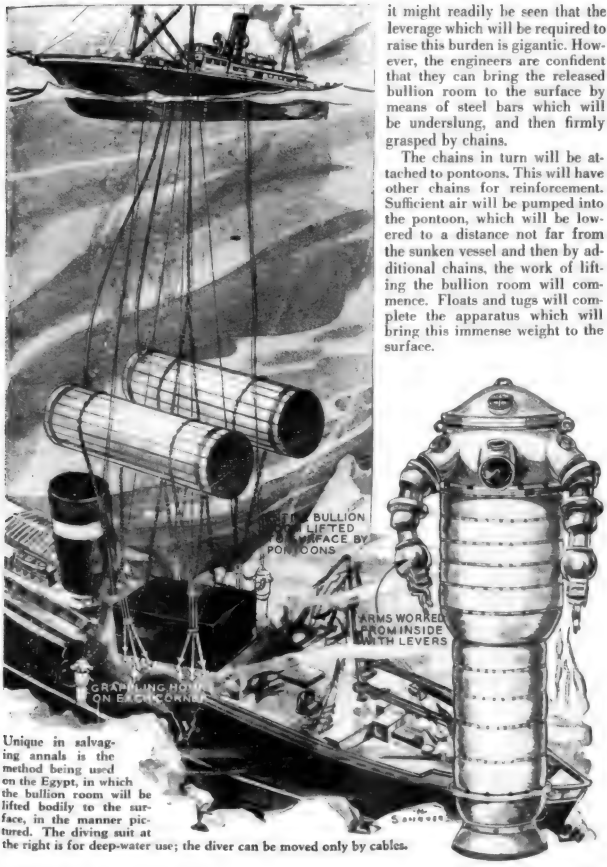
Although by last October 1st the divers had succeeded in ascertaining the ship's location and had begun to blast away at the various decks so as to lift the bullion-room containing the $5,000,000 gold hoard, the engineers estimated that it would require nearly another year before all the treasure was retrieved.

Masterful ingenuity has been brought into play during the salvage operations. The *Egypt* gold-hunters have evolved a remarkable piece of apparatus which will do much to revolutionize the whole salvage industry. So unique is it that they are already talking about tackling the *Lusitania*, sunk during the war off the coast of Ireland, just as soon as the liner *Egypt* job is done.

This is the system they are following. The divers, by means of specially-made diving outfits, are able to cut away at the hull of the boat and actually ferret their way into the interior. With the location of the $5,000,000 bullion room established, they intend to cut that quarter free from the remainder of the boat and lift it in its entirety.

As the contents of the bullion room weigh 48 tons and the structure itself twelve tons,

Depth to Recover $5,000,000



Unique in salvaging annals is the method being used on the Egypt, in which the bullion room will be lifted bodily to the surface, in the manner pictured. The diving suit at the right is for deep-water use; the diver can be moved only by cables.

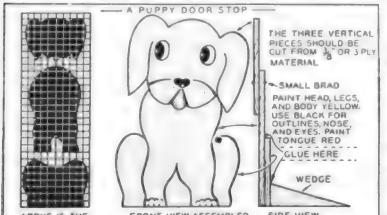
it might readily be seen that the leverage which will be required to raise this burden is gigantic. However, the engineers are confident that they can bring the released bullion room to the surface by means of steel bars which will be underslung, and then firmly grasped by chains.

The chains in turn will be attached to pontoons. This will have other chains for reinforcement. Sufficient air will be pumped into the pontoon, which will be lowered to a distance not far from the sunken vessel and then by additional chains, the work of lifting the bullion room will commence. Floats and tugs will complete the apparatus which will bring this immense weight to the surface.

HANDIKINKS

In this department you will undoubtedly find several simple kinks or ideas that will aid you in performing daily tasks which fall to your lot.

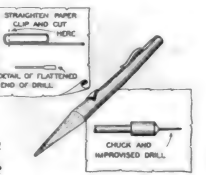
Door Stop Shaped Like Puppy Makes Attractive Ornament for Room



A VERY ornamental and strikingly realistic door stop that will hold the door open at any angle can be made from a 5x14-inch piece of 3-ply wood or ¾-inch white pine, as illustrated at the left. The design is sketched out on squared paper and traced on the wood, which is then cut out with a scroll saw. The wedge is made from a piece of wood 4"x4"x1", which is glued to the bottom as shown. —Dale Van Horn.

Clip Makes Drill to Bore Out Clogged Pencil

A SMALL, improvised drill for cleaning out the lead of a clogged pencil can be made in a short time from a simple metal paper clip. This clip is first straightened, as shown, and its point sharpened with a file, making it slightly oversize. When placed in a high speed drill, the device will bore out the lead thoroughly.—L. P. Young.

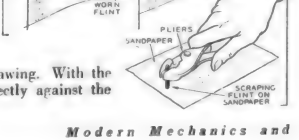


Handy Tack Puller From Old Auto Poppet Valve

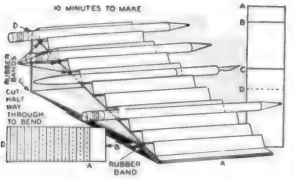
A POPPET valve from an automobile engine can be converted into a tack puller by a few minutes' work at a grinding wheel. Select a valve that has a key slot near the end, then saw or grind it to a 30 degree angle on a plane through the slot, as illustrated at the left. The round valve head makes an excellent handle as well as a convenient stand.—Walter Burton.

How to Repair Defective Lighter

IF YOUR cigarette lighter throws a rich spark but fails to light, it is usually because the flint is worn so that the spark misses the wick. This can be remedied by removing the flint and sandpapering it down till the end is flat, as shown in the accompanying drawing. With the flint thus filed off the sparks are thrown directly against the wick, causing it to ignite.—Oswald Barton.



Ideas for the Draftsman



Desk Pencil Holder from Cardboard

THE pencils, pens, etc., which usually clutter up a draftsman's or office worker's desk can be taken care of by keeping them in place in a simple, handy holder, such as is shown at the left, which is made from a piece of cardboard, folded on the dotted lines shown, and glued together at the ends. Rubber bands fastened to the edges will give rigidity.—Donald McFee.

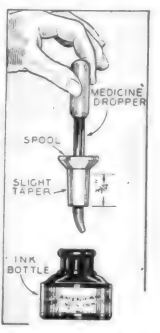
Handy Triangle Rest for Drawing Parallel Lines

WHEN drawing bolt threads, mechanical draftsmen will find that they can save considerable time by utilizing as a base for the triangle a simple strip of wood with common brass pins driven through the ends to hold the rest in place on the paper, as illustrated in the drawing at the right.—John Edward Hyler.

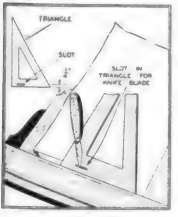
Oiled Felt Makes Cleaner for Ruling Pens

THE neatness of the mechanical drawing work you do depends a lot upon how clean you keep your ruling and compass pen. An excellent cleaner, which is very handy and inexpensive, consists simply of a piece of felt soaked well in some good grade of light machine oil. As this material slips very easily between the pen it makes a very effective cleaner.—Richard Telke.

Dropper and Spool Make Quill



IN CASE you lose the quill and stopper of your ink bottle, you can easily rig up another quill which will serve much more efficiently than the original. First procure an ordinary medicine dropper and a spool and trim down the latter as shown in the drawing at the right. Next, heat the point of the medicine dropper over a small flame, drawing it to a very fine, tubular point. The dropper is finally placed in through the hole in the spool so that its point reaches well down into the ink.—Oscar Winters.



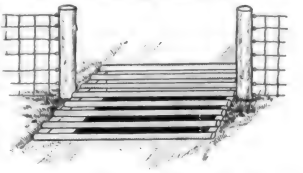
Trimming Drawing Paper

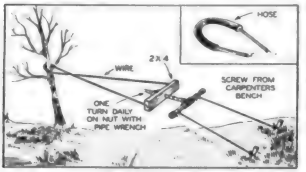
DRAFTSMEN who have a bit of difficulty trimming neat borders on their drawing papers will find the task made easy by rigging up a guide as illustrated in the drawing at the left. Using a sharp jack-knife, cut a little slit into the triangle, about one-fourth inch from the lower edge, so that by holding the point of the knife in it, a cut can be made parallel to the edge of the T-square. In this manner borders can be trimmed rapidly with no fear of slicing the edge of the T-square, as is often done.—Robert Dolman.

Helps for the Farm

Pit Covered With Poles Makes a Novel Gate to Keep Back Livestock

AN extremely unique gate which will allow people, autos, tractors, etc., to pass through, but which will keep back the livestock, is not a gate at all but simply a trench or pit dug between the gate posts and covered with scantlings or posts, strong enough to sustain considerable weight, as shown in the accompanying drawing. This pit should be about two feet deep, and should extend about two feet on each side of the posts.—F. C. Gardner.





How to Straighten Inclined Trees

A SIMPLE and effective device for bringing a tree that has grown at an angle to an upright position can be made by inserting a screw from a carpenter's bench in a two-by-four and wiring the two parts to the tree trunk and stakes as illustrated at the left. By making one turn a day on the screw nut against the 2x4, the tree can safely be brought to an upright position, where it will remain without braces.—Hi Sibley.

Old Tobacco Can Makes Good Hoe Cleaner

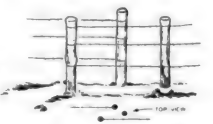
HALF of a gardener's time is taken up whittling out a hoe cleaning paddle and the rest spent in trying to keep the paddle from breaking. A far better cleaner can be made, however, by simply pulling the cover off a tobacco can and pounding the mouth or opening together into a tough blade-like edge, as shown in the photo at the right.—Frank Bentley.

Cutting Off Large Tree Limbs

THE average amateur tree surgeon who attempts to cut off a large limb of a tree without knowing exactly how to go about it may damage the tree considerably or destroy it altogether. The correct method for accomplishing this is illustrated in the drawing at the left. An undercut made a few inches from the trunk will prevent down splitting when the main cut is made. When the job is done, the remaining stub can then be sawed off flush with the trunk.—James Riley.

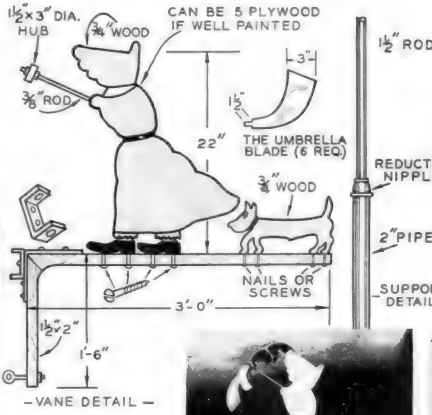
Serviceable Gate to Connect Yard with Lawn

ANOTHER type of gateway which will serve very conveniently between the barnyard and the lawn about the house can be installed by simply stringing up the fence wire to three posts arranged as illustrated in the accompanying drawing. This gateway will admit people but will keep back livestock.—William Watts.



A Distinctive Weather Vane

The completed vane is mounted atop an iron pipe at any desired height, as shown above.



The figures are cut from 5-ply wood in the forms shown. The entire vane swings on a ½-inch pipe which projects up through the eye-bolt and the U-shaped strip.

The old woman's umbrella, made of cutlass-shaped blades, revolves in breeze.

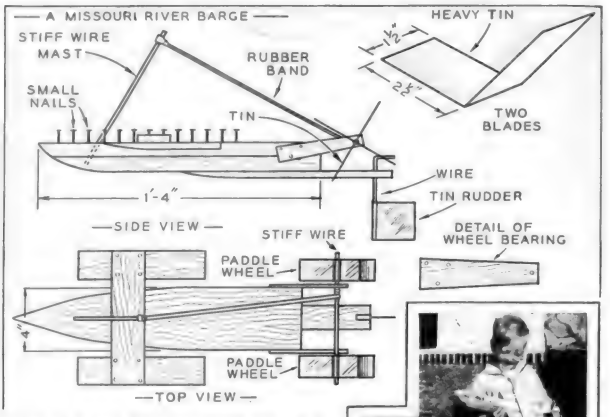
IF you want something that is both serviceable and distinctive in the line of weather vanes, here's the thing—a story telling weather vane that is shaped like an old woman carrying an umbrella and followed by a puppy dog. The forms of the woman and the puppy are cut from 5-ply or ¾-inch clear wood with a band saw after the outlines have been traced in pencil. When completed, they are fastened in the manner shown to the horizontal supporting arm, which is 36 inches long. This arm is fastened at a right angle to an 18-inch vertical arm by means of glue and an angle iron.

The vertical piece is attached to the pipe which supports the entire structure by means of a ⅝ or ¾-inch eye bolt at the lower end, and a low, U-shaped piece of strap iron at the top, as illustrated in the drawings above.

The revolving umbrella consists of six blades which are shaped somewhat like a cutlass. Each has a tenon that fits into accurately spaced holes in the hardwood hub shown. The blades taper from ¼-inch thickness at the outer ends to ½-inch thickness at the inner or tennoned end. When ready to assemble, coat each tenon with good glue and insert in the hubholes, so that the blades all slant slightly to the woman's left. This slant produces the whirling in the wind.

Mounting the vane is a simple task. A length of 2 or 2½-inch pipe is set firmly in the ground with concrete about it. A length of 1½-inch pipe tops this through a reducer, and ½-inch piece in turn tops the latter. This ½-inch piece of pipe projects through the eye bolt and the U-shaped piece of strap iron on the vertical leg to support the vane.

A Miniature River Barge



One end of the long rubber band, which furnishes the motive power for this novel barge, is fastened to the stiff wire mast, while the other is wound evenly around the shaft of the paddle wheels, as shown in the drawing.

A MINIATURE edition of those picturesque Missouri river barges which at one time plied the rivers of the country makes a fascinating and attractive toy. The one such as described here is propelled by rubber bands and will pound away up or down stream for a considerable distance. The only equipment you will need is some scrap materials, and a few ordinary tools.

The body of the boat is made of two soft pine boards nailed together and planed down on the sides in taper fashion as illustrated in the drawings above. To give buoyancy, the boat is equipped with a pair of outriggers consisting of an eight-inch strip of wood which is nailed across the deck just abaft the mast, and to which is fastened two other pieces of the same material in the form of pontoons six inches long, with the front ends nicely rounded.

To make the propelling mechanism, first cut off a piece of stiff wire ten inches long and thrust one end of it down into a hole in the deck to form an inclined mast, as shown in the drawings. The paddle wheels

This ingenious toy barge will propel itself for a considerable distance across the water.

are each made from two strips of heavy tin five inches long and 1½ inches wide, both of which are bent in the center at right angles. The two pieces are soldered together at the angles to form a four-bladed wheel.

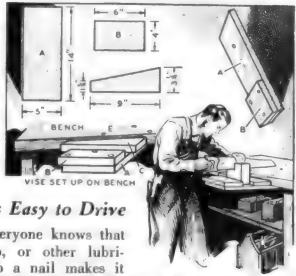
The shaft, to which the two paddle wheels are soldered, is made from a piece of stiff wire 7½ inches long. To make the bearings, cut out two strips of heavy tin as illustrated, and screw them to the sides of the hull. Holes are punched through the further ends of these strips, and the shafts run through them.

Finally, get a stiff rubber band about 14 inches long and fasten one end to the top of the mast and the other to the shaft, winding it on evenly and smoothly.

Workshop Labor-Savers

Simple Bench Vise Uses Wedge

THERE is no excuse for any workshop fan's being without a vise, for with a few pieces of 1½-inch planking you can rig up one that beats all for simplicity. First cut out 3 pieces of the planking of the dimensions shown at the right and fasten two of them, A and B, which are held together with pegs as shown, at an angle to the workbench. Work is held in place by the wedge.—Irvines Landing.



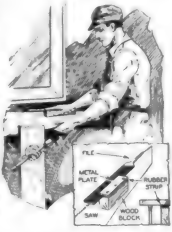
The tip of the nail is lubricated with wax pressed into a hole in the hammer handle as illustrated here.

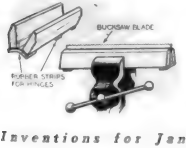
Makes Nails Easy to Drive

ALMOST everyone knows that wax, soap, or other lubricant applied to a nail makes it easier to drive and prevents splitting of the wood. A very convenient place to carry the supply of wax for this purpose is in the hammer handle. First, bore a ¼ or ⅜-inch hole in the end of the handle to a depth of about ½ inch. Then fill the hole with beeswax, either by melting and pouring it in, or pressing it in with the fingers while in a soft state. When driving nails, first place the tip of each one in the wax and then proceed to pound away. It will be found that by lubricating the ends in this way you can do a much neater job on woodwork. The same method may be used with wood screws. Always keep the hole full of the lubricant.—James Schall.

File Mounting Makes Saw Jointing Easy

AN ORDINARY flat file can be used to a much better advantage in jointing a handsaw if mounted in the manner shown in the drawing at the right. A metal plate and a strip of rubber is fastened on a block of wood to serve as a holder for the file. The rubber should be just a little thicker than the file. This not only makes it easier to slip the file in place but also keeps the metal from tipping back when a tight grip on the file is attained by turning the adjusting screw.—Weston Olson.





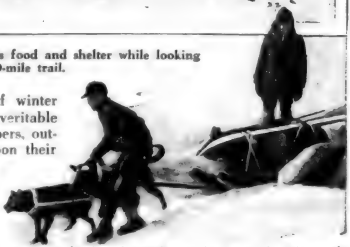
Filing Clamp for Narrow Buck Saw Blades

TWO pieces of stiff hardwood hinged with strips of old inner tube rubber make an excellent clamp for filing narrow saw blades. Along the lower edge of one of the wood pieces a strip of inner tube is tacked to serve as a stop for the blade and to tilt the wooden sides so that they will pinch firmly along the upper edge.—Walter Brixius.

Trapper's Trail Brings

At such outposts as this, the trapper finds food and shelter while looking after his traps, often scattered over a 200-mile trail.

LONG before the magic touch of winter turns the northern forests into veritable icy fairylands, hundreds of lone trappers, outfitted for the long winter, set out upon their yearly journeys into the uncharted wilderness, there to establish their camps and make ready for catches of foxes, minks, skunks, raccoons, etc., that will earn them between $3000 and $6000 each for a few months' labor. For bountiful old Mother Nature has stocked the United States, Alaska and Canada with fur-bearing animals, whose pelts, properly prepared, will bring home the bacon, so to speak, in the form of fat checks from the fur exchanges.



Carrying food and supplies to last over the winter, the trapper mushes his way with sled and dogs to the part of the country where he will establish his trap line.

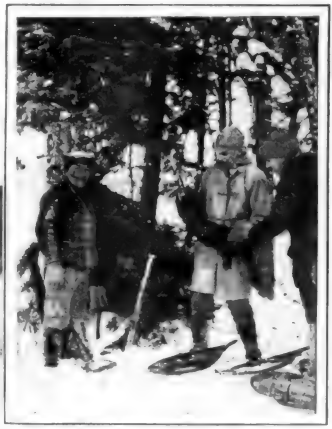
Neither unemployment nor hard times affect these trappers, who, merely accepting the gifts of nature, harvest thousands of golden dollars by capturing the many wild animals which abound all over the continent. Trapping is one business that remains unaffected by panicky times, and this season promises to be one of the best. Thousands of farmers will rake in between $50 and $500 this winter by just following the creek bottoms and catching the animals that inhabit them.

The trapper who makes his livelihood at the business goes about his work in a systematic and painstaking manner, learned from long experience. First he establishes his headquarters in a log cabin beside some pine-rimmed or placid lake; then selects the most promising waters along which to lay his trap lines, blazes the winter trails, collects a plentiful supply of wood, oils his traps, puts his radio set in order, and is

PROFIT and THRILLS

by EARLE W. GAGE

With the advent of winter, thousands of lone trappers go forth into the ice-bound wilderness to set their lines of traps and capture the fur-bearing wild animals whose pelts bring rich profits. In this article, Mr. Gage tells of their methods and rewards.



Here the trappers have just caught a black fox. In capturing this animal, a "land set" for the traps must be carefully made, lest the fox become suspicious.

thus ready for another adventurous, hazardous, and profitable season at outwitting the fur-bearing denizens of the wilderness.

The silver fox is regarded as a prize catch. A single pelt often brings as high as $1000. Keen-scented and suspicious, he presents the greatest problem of all to the trapper. Ground and traps must be free from odors.

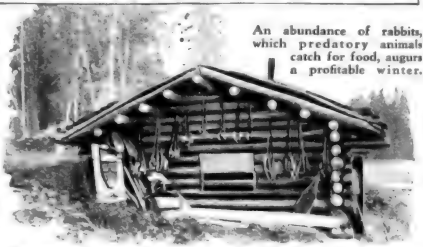
"More rabbits are roaming the forests this year than at any other season since 1925," advised Donald "Curly" Phillips, veteran guide and trapper of Jasper Park, Alberta. "This means that furs are going to be plentiful. Rabbits are the chief food supply of predatory animals, and when rabbits increase a much larger catch of first class fur is secured.

"Every seven years rabbits die in great numbers; then the animals which prey upon them must move on or themselves pass out. With the resultant disappearance of fur-bearing animals, rabbits again increase in numbers, and the curious cycle of Nature is once more

renewed. That explains why I am all set to spend a most profitable winter on the trapline."

This lowly rabbit is the best "fur-barometer" known to trappers. A shortage of rabbits forecasts a light catch, since the ever-hungry, roving coyote, its near-relative, the timber-wolf, the keen-eyed lynx and the cunning fox are all dependent to a degree on smaller prey—the rabbit.

Thus it is that the present plentiful supply of rabbits promises profits to the experienced trapper, who, by using good traps and a few simple rules, may reap a golden harvest this winter.



An abundance of rabbits, which predatory animals catch for food, augurs a profitable winter.

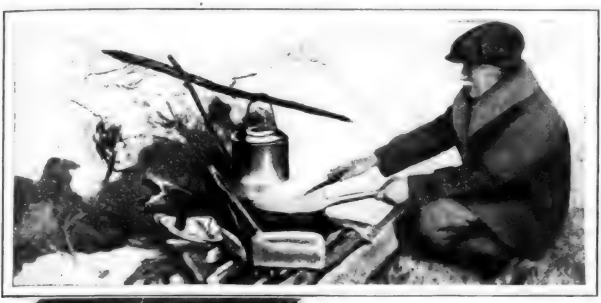
The trapper's headquarters is usually a log cabin in the wilderness. Here he lives when not out on the trail, and prepares his pelts for the market. A radio often entertains him during lonely hours.

There are several reasons for this optimism. Fur houses are in need of several varieties of pelts, and prices are good. Although furs slumped in price a year ago, which was thought disastrous, lower prices permitted a larger number of people to purchase furs: the universal demand resulted in mass production, insuring a steady, profitable price to the trapper. There is now a brisk demand for such common furs as mink, skunk, raccoon, red fox, and other pelts.

Trapping raccoons, skunks, muskrats, and foxes in the Middle Atlantic territory, the West, or South, although netting the trapper handsome returns, is not on a par with trapping in the remote northern wilderness, where thousands of acres of primeval wilderness abound in higher priced furs. The successful professional Canadian trapper operates anywhere from 150 to 250 miles of trap line, scattered along at likely spots and on "runways" for the fur bearers. Most animals are nocturnal, and traps and snares reap their largest harvest during the hours of darkness.

Along each line between 200 and 300 traps are set to catch beaver, otter, ermine or weasel, fisher, wolf, lynx and fox. At the end of each trap line is a reserve cabin containing fuel and a supply of food. The trapper's nearest neighbor may be several hundred miles away, which means that he must tote in sufficient supplies to last

Trappers Earn Between $3000 and $6000 from a Good Winter's Catch



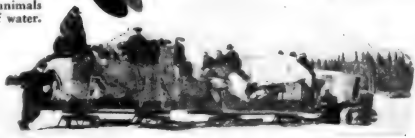
The trapper experiences the utmost in the thrills of out-of-door life. When on the trail, he carries his grub and cooks his own meals.

A valuable specimen of the white beaver is shown above. These animals are caught near large bodies of water.

throughout the winter, and use greatest care that he does not get injured and perish.

Trappers are classified as trail setters, bait setters and river or lake trappers. Each has his own methods, and there are nearly as many methods as there are successful trappers. The trail setter goes after the larger game—foxes, wolves, lynx, which are harder to catch, but when caught, bring the big money. These animals range far and wide, and when traveling across country follow the well defined trails. By old logs and other obstructions in the trail the sets are made. About six inches from such an obstruction, just where the animal would land when leaping across, the trap is set.

"It is a common mistake to think an animal goes directly to a trap," explained an experienced trapper. "Once they get a scent of the bait, they sniff a little. A fox is too smart for that. He makes a thorough investigation first; ofttimes he does not even approach the trap. While he is making his investigation is the time to catch him.



At the end of the trapping season, the furs are hauled to the nearest trading post with tractors and sled trailers as shown in this photo.

"If an old log is near when he catches the scent, he will leap onto it and walk the full length several times, muzzle in air, sniffing the wind. At the end of each log I heap a mound of earth, sawdust, or manure. This is made just as high as the highest end of the log. At the highest point of the mound I place a No. 1½ trap, covering it over lightly with the material of which the

(Continued on page 192)

Movie Makeup Truck for any "Location"

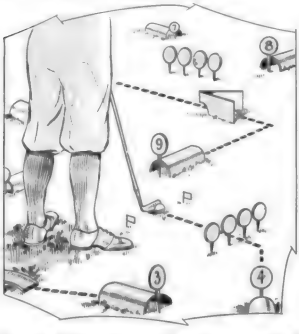
This portable make-up truck, used by a Hollywood film company, can be taken to any "location."

FILLING a long-felt need, the first portable make-up truck has made its appearance at the Fox Films Studios in Hollywood. The truck, which is twenty feet long and eight feet wide, and white-enameled throughout, can be attached to an ordinary automobile and taken to any out-of-the-way motion picture "location" accessible by car. A make-up department in itself, it consists of two rooms and contains hot and cold water, a Frigidaire, a full-length mirror, four make-up tables, a manicure table, and a large cabinet for supplies. It is equipped with its own generator system, which furnishes power for electric lights, connections for curling irons and heaters, and for an eight-inch electric fan.

The truck is equipped with make-up tables, supply cabinets, electric generator, and a Frigidaire.

Tom Thumb Golf on Your Lawn

AT ALMOST any large department store now a-days it is possible for golf fans to purchase parts and build a practical portable miniature golf course on their own lawn. The parts consist of a number of metal pegs, bridges, and other obstructions which serve as hazards, as shown in the drawing below. In the place of holes, this course uses semi-circular shaped pipes, numbered in the usual manner. The chief advantage of this course is that it can be set up in any suitable place in a few minutes.



Hazards of this miniature golf course are made of metal pins, bridges, etc., and the holes of pipe.

Tank Holds Reserve Heat Supply

A TANK full of heat, collected when convenient during the night or when there is no great demand for steam boiler capacity for other purposes, and then doled out to customers during the day as heat is needed, is the latest device of the Electricity Works at Hamburg, Germany, to increase the efficiency and cheapen the cost of their service. The great tank is made of welded steel, and is so insulated that it will hold heat for a week.

Circus Daredevil Leaps Fifty Feet in His Miniature Auto

VISITORS to the Alexandria Palace, in London, are furnished with thrills by a death-defying stunt which the side show barker calls the "Leap of Death." Seated in a diminutive auto resembling a roller coaster, Rene Fumy, the daredevil performer, shoots down a precipitous track at a breakneck speed of 100 miles per hour, leaps into the air and across a space of fifty feet, and lands on an inclined platform, which if missed, would probably bring death.

The car used in performing the feat is equipped with small wheels that fit the tracks on the incline which gives the impetus for the leap.

Rene Fumy performing thrilling fifty-foot "Leap of Death."

Four Musical Instruments in One

Mr. Main Wood playing his orchestral guitar.

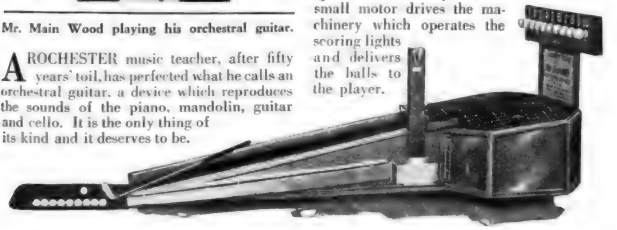
A ROCHESTER music teacher, after fifty years' toil, has perfected what he calls an orchestral guitar, a device which reproduces the sounds of the piano, mandolin, guitar and cello. It is the only thing of its kind and it deserves to be.

Automatic Golf Putting Machine

THERE seems to be no end to the novel contrivances devised for the amusement of amateur golfers. The latest in golf and near-golf games is a putting machine whose action is entirely automatic—all the player does is deposit a dime in a slot, push a plunger, and proceed to swat away at the ten balls which roll out of a chute down on the putting green.

The device consists of an incline about eight feet in length, which leads up to an octagon shaped platform containing the hole. With each putt that successfully "holes out" a light on the back of the machine flashes, automatically keeping the player's score. Each putt which misses the hole fails to register, the ball dropping into a slot and going back into the machine, where it remains in readiness to be delivered to the next player who drops a dime in the slot. The swatting keeps up till all ten balls are disposed of.

The machine is entirely electrical in its operation and requires no attendant. A small motor drives the machinery which operates the scoring lights and delivers the balls to the player.



This putting machine delivers balls to players and registers score by electrically operated machinery.

It's Easy to Become a

A French glider, designed and built by Avia, at St. Cyr. This glider is endorsed by the French Air Ministry.

by JAY EARLE MILLER

It is now necessary to obtain a glider pilot's license before going in for this thrilling sport. The author of this story not only tells how to get a license but gives you a complete course in glider flying.

Part I

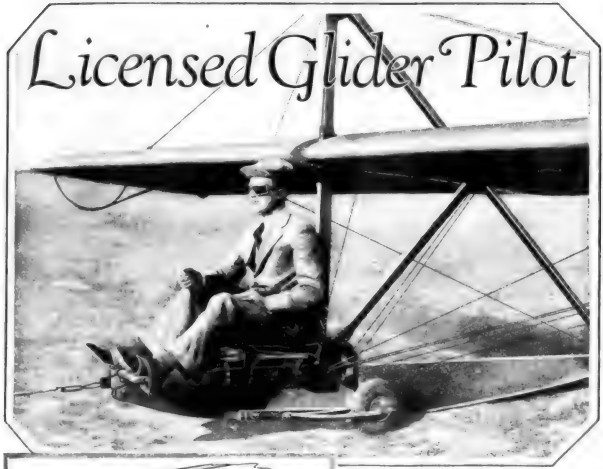
THIS afternoon, under the critical eye of a Department of Commerce Aeronautics Inspector I took the flying examination for a non-commercial glider pilot's license.

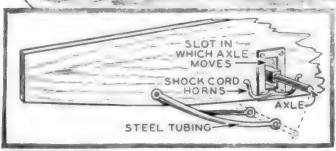
Three times, on the end of a 700-foot length of half-inch manila, I took the air, climbed the ship to between 400 and 500 feet, cut loose and glided back to earth. The first flight I was told to land straight ahead. The second to do a figure "S" to the left and then the right. The third was an "S" starting in the opposite direction. That's all you have to do to get one of those little black books, stamped in gold with the magic words "Pilot's License," with a green certificate inside certifying that for the next year you can pilot gliders for sport.

The author ready to take the air with his 220 pounds strapped in the seat. Quite a load for a primary glider.

If you want a commercial license, one permitting you to teach others to glide, you invest $10 in a physical examination—the same one given applicants for private airplane licenses; and, in addition to a straight flight and the "S" turns, you must do 360 degree

Licensed Glider Pilot





The landing gear for a primary type glider. The metal faced slot gives the axle about four inches of play.

Side view of the Gull, fitted with landing gear and steel tube wing tip skids.

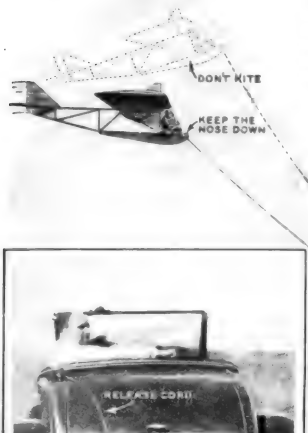
turns and make precision landings somewhere near a flag.

With the auto tow method of launching and a good primary glider you can do all those things. In fact, with a 700-foot tow rope and a flat field you can do everything with a primary ship that can be done with a secondary or a soaring glider, except soar. Soaring in a sail plane, you know, requires rough country and a rising air current, usually found on the windward side of a hill.

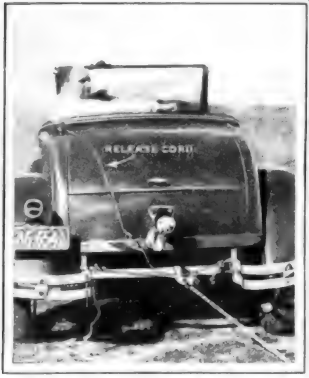
This is the story of how you can learn to glide; the things to do, and the pitfalls to avoid. It deals with the auto tow method of launching because that is favored by most of the larger gliding schools. At the Hawley Bowlus school on the west coast 200 students were graduated without so much as scratching the paint on a glider. At the Chicago Gliding School no one has ever been hurt by this method, and glider damage in training has been largely confined to flying wires broken by stones while towing on the ground, and punctured tires due to the roughness of the airport.

For auto towing you need a strong and sturdy glider, for even on a fairly smooth field it gets an enormous amount of punishment when being towed 25 to 30 miles an hour. Any good manufactured ship such as the Detroit Aircraft Gull or the Waco primary trainer is suitable, or any good home built design, such as the Northrop primary glider, plans for which were published in MODERN MECHANICS' 1930 FLYING MANUAL. It's a waste of time and money, though, to build any light-weight, fragile ship.

Regardless of the ship you use—home built or factory product—some minor changes will help it stand up under the punishment. One change is to face the skid with a steel strip,



Never "kite" a glider. Kiting is trying to climb too rapidly while towing. Unless the auto speeds up rapidly at a steady rate the glider will stall.



The tow rope is attached to the car with a quick method of releasing it. A pull on the lanyard will release the glider if the student fails to act.

dragging a wing while getting up speed. The fore and aft loop of the skid is deep enough to allow the aileron to clear the ground when the wing tip is down, and the arm of the "Y", welded at the lowest point, is bolted to the trailing spar to form a brace when a wing tip drops and digs in as the glider turns.

The added weight, of course, cuts the gliding angle somewhat, but with auto towing and a 700-foot rope you can get an altitude of between 500 and 600 feet—plenty to make 360 degree turns and perform other maneuvers—so the sacrifice in gliding range is not important.

If you live in one of the twenty or more states requiring a federal license for aircraft and pilots your glider must be either a manufacturer's product built to an approved type certificate, or, if home built, must be built to approved plans and specifications. Since Oct. 1, 1930, no home-made gliders have been granted licenses unless the plans had previously been approved. And, if you live in those same states, you must have a student's permit from the Department of Commerce and be taught by a licensed instructor. The student's permit costs nothing and can be obtained by mail.

Now for the training: The first thing is to learn to handle the controls, one at a time. The usual procedure is to face the glider into the wind, strap the student into the seat, and let him practice keeping the wings level. With a properly designed glider you can get aileron control in a wind of 5 to 10 miles an hour velocity. In the better schools the first half hour is spent in stationary practice on the ground, the student learning the ailerons while the instructor explains the controls.

The next step is rudder practice, while be-

¼-inch thick and two inches wide and about six feet long, attached with wood screws at intervals of a foot. A wheel landing gear, equipped with a pair of airplane tail skid wheels, with 3"x10" rubber tires, as shown in the photographs and one of the sketches, is a big help, too. Rubber shock absorber cord, such as is used on airplanes and in shock absorber launching of gliders, is used to tie down the axle to the small "U" shaped fittings bolted to the skid.

The third change is the addition of steel tubing wing tip skids to take up the shock of

ing towed across the ground just below flying speed, so the student can't get into the air. A 300 foot rope is used in all the early instruction, not only to keep the instructor closer to the student but to speed up practice. Facing into the wind, the tow car—any roadster or touring car will do—slows up as the student lifts one arm to signal that the rope is nearly taut. As the car takes up the slack the student lifts both arms over his head to signal he is ready.

The car starts ahead, picking up speed smoothly. Gears must be shifted quickly and smoothly, so that no jerks will be transmitted to the glider, and so it will

Here is the proper way to cut loose from the tow rope. Note the nose is kept down.

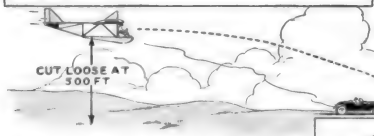
not lose speed and controlability during the shifts. In moderate winds a speed of 15 to 20 miles an hour is about right for ground practice. As the wind velocity increases, of course, the car speed should be less, as the air speed of the glider is the car speed in one direction plus the wind velocity blowing in the opposite direction.

Several trips are made across the ground while the student practices following the car by working the rudder, at the same time keeping the wing tips level. The instructor, watching over his shoulder, makes suggestions at the end of each run, particularly noting if the wing tips are absolutely level, and the ability of the student to follow the car in a straight line. Until both of those things are mastered it isn't safe to take the glider off the ground.

Once that is learned, the flippers come next, and you begin to get into the air. The first flights are short and never high. A foot

Here is a novice learning about the controls of her craft. Ground work is an essential preliminary.

or two is sufficient and in a run of a half mile or so a half dozen short hops can be made. The trick is to take off, rise a foot or two, fly level for a few seconds, then nose down to pick up speed, pull the stick well back and make an easy landing well back on the skid. With only a foot or two to drop a pancake landing can do no harm to the ship, and only shake up the pilot. The stick should not be pulled back to lift the ship off the ground. Hold it in neutral and let the ship fly itself off as the tow car picks up speed.



Above: Martin Schempp, German gliding instructor for the Syracuse Gliding Club, flying a primary glider built by Lieutenant H. A. Reynolds.

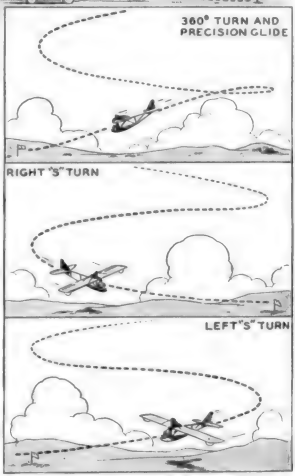
The instructor then has complete control and, if you try to rise too high, can set you down instantly by slacking speed. In fact a glider stick need never be pulled back on neutral except for landing until you begin making altitude flights of several hundred feet and have enough experience to know where the stalling point lies, and so avoid it.

Eleven people were killed in the United States on gliders in 1929, probably in every case because they pulled the stick back and stalled the ship, without sufficient altitude to get it out of the stall. It takes anywhere from 20 to 150 feet to bring various makes of commercial gliders out of a stall, so there is no sense in experimenting with one. Curiously enough, the majority of the eleven fatalities involved licensed airplane pilots, who looked on the glider as a toy, and tried to fly it in the same way they would a power ship. That tendency on the part of airplane pilots is so marked that the better glider schools will not allow an airplane pilot to fly a glider until he has taken the complete course.

The best training in glider flying comes in the first twenty feet above the ground. If you can handle a glider perfectly near the ground, keep it level in strong, gusty winds, learn to be so quick on the controls that you neither bounce upward on a rising gust or drop in the downward current of an "air pocket," you have mastered the most difficult part of flying either a glider or an airplane. In fact, experienced glider instructors say a glider graduate should be able to solo a power ship with about two hours of dual training, instead of eight or ten. And, with glider training costing about $6 an hour, or $60 for a ten-hour course, and airplane instruction about $30 an hour, that would mean a saving of around $180.

After the trick of rising a foot or two and making good landings has been mastered the

(Continued on page 186)



These four sketches show the requirements necessary for obtaining a glider pilot's license. First is a straightaway landing from a height of 500 feet. Next is a 360 degree turn and landing to a mark (required only for commercial license). The others are right and left "S" turns.

New Smokeless Photo Flashlamp Operates From Battery

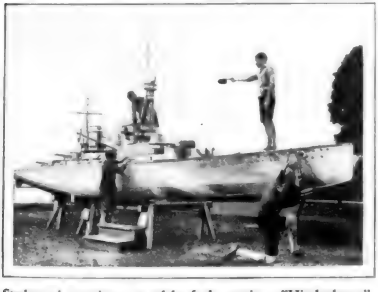
FLASH-LIGHT powder is a thing of the past, thanks to the latest fireless, smokeless, odorless, noiseless, and above all, harmless photographic flashlamp recently perfected by electrical engineers. This new flashlamp consists of a clear glass bulb filled with pure oxygen and a quantity of very thin crumpled aluminum foil. The flash is set off by means of a flashlight filament coated with a special preparation, and hooked either to the 110-volt house current or to a couple of dry cells.

The chief advantage of the new lamps is that there is no hazard in using them — no sparks to drop on rug or table, no fumes, no cloud of stifling smoke. The flash is confined entirely within the bulb. Thus pictures can be taken indoors without the necessity of airing out the room afterwards.

The duration of the flash is approximately 1/50 of a second and is thus long enough to stop the more usual movements of people, and fast enough to obtain a photograph before the person can blink.

Photos show flashlamp, filled with aluminum foil and oxygen.

Model of German Cruiser *Hindenburg* Masterpiece of Fine Workmanship

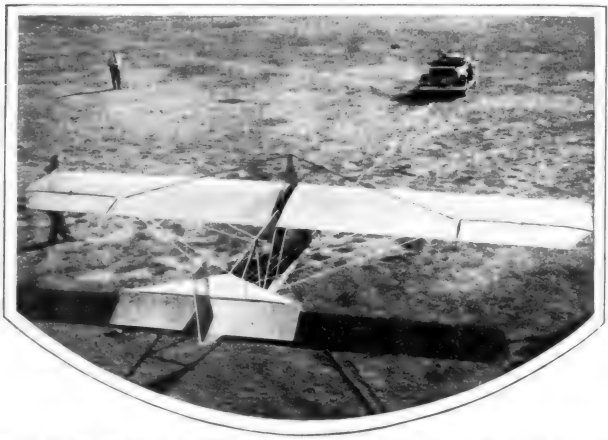


Students inspecting a model of the cruiser, "Hindenburg."

AT THE 1930 model boat show held recently in Potsdam, near Berlin, a model of the New German cruiser, *Hindenburg*, attracted wide attention by its workmanship and fidelity to detail. Chief among the interested spectators were a group of German students, who, as shown in the photo at the left, were allowed to examine the model as thoroughly as they pleased.

The model was constructed by a German ex-navy man now a resident of Berlin. The work of assembling the parts required about a year's time, to say nothing of the toil.

Building the M-M



Here's the glider all set for its first flight. The tow car is in the background and the manila rope used in the launching can be seen. Note the man holding up the wing tip until the glider has taken off.

by ORVILLE HICKMAN

In Two Parts—PART I

WHAT an ideal day it was for the launching and testing of the new M-M Glider! A light wind blew up the field, and for a wonder, in the right direction.

The glider, built to my designs by us fellows at the Robbinsdale Airport, was much heralded. For days little groups of men had gathered about the hangar doors, peering in to see what progress was being made. The ship was ready, but to our dismay we found that unless we had a north and south wind we could not accommodate the car and the rope and the glider.

But at last the wind blew from the right direction. The waiting game over, Gene Shank organized the ground crew. Fresh from flying a Bowlus type glider, he took into account his experiences with that type of machine. I was put at the wheel of Shank's Chrysler roadster, my brother, Emery, and another lad were shown how to run alongside the wing tips until the glider gathered enough speed to make the ailerons effective. This, they were told, would be about ten miles an hour, and they were merely to hold their hands under the wing tips, flat like, until the glider flew off their hands.

A tense air of expectancy hovered about the field. The work of weeks was coming to a crucial test. Would a secondary, or semi soaring type of glider, capable of staying aloft two or three times as long as the ordinary primary glider, be successful on her first hop?

That's what we were to find out.

Secondary GLIDER

Here they are—plans for a semi-soaring type of glider which will stay aloft two or three times as long as the ordinary primary type. This glider was designed and built especially for Modern Mechanics readers—that's how it comes by the Double-M initials which distinguish its name. It was built by Orville Hickman, the well-known airplane engineer who designed the Starling, Pheasant, and other popular planes, and has been flown by Pilot Gene Shank and others in a series of test flights which proved it a remarkable performer.

At the wheel of the roadster, it was to be my duty to start her off second gear, and keep her there at constant acceleration. This was to avoid the usual jerk attendant upon shifting gears, which is very dangerous on a takeoff, because a glider stalls in "nothing flat."

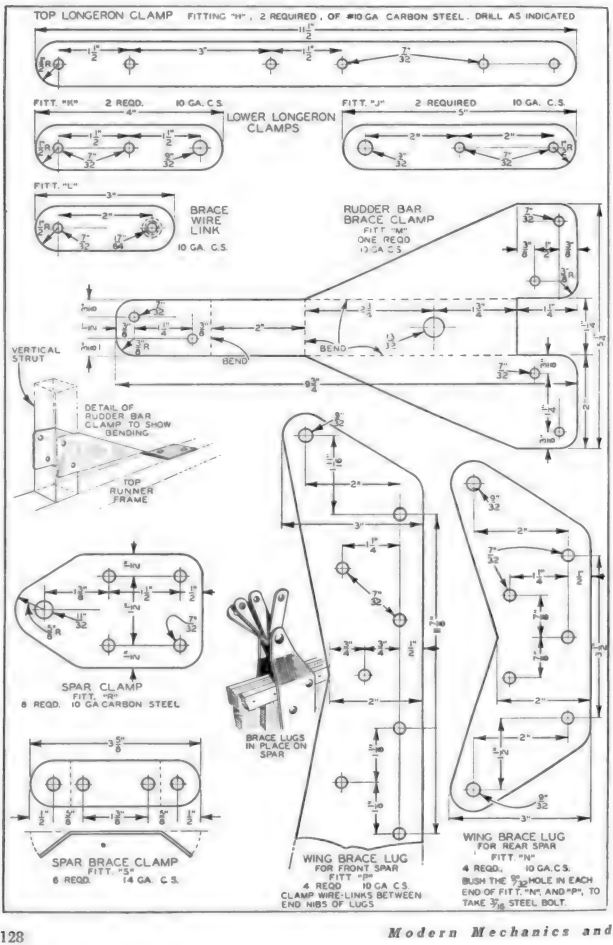
A man accompanied me on the running board. His function was to accurately convey the signals which Shank would wave from the cockpit.

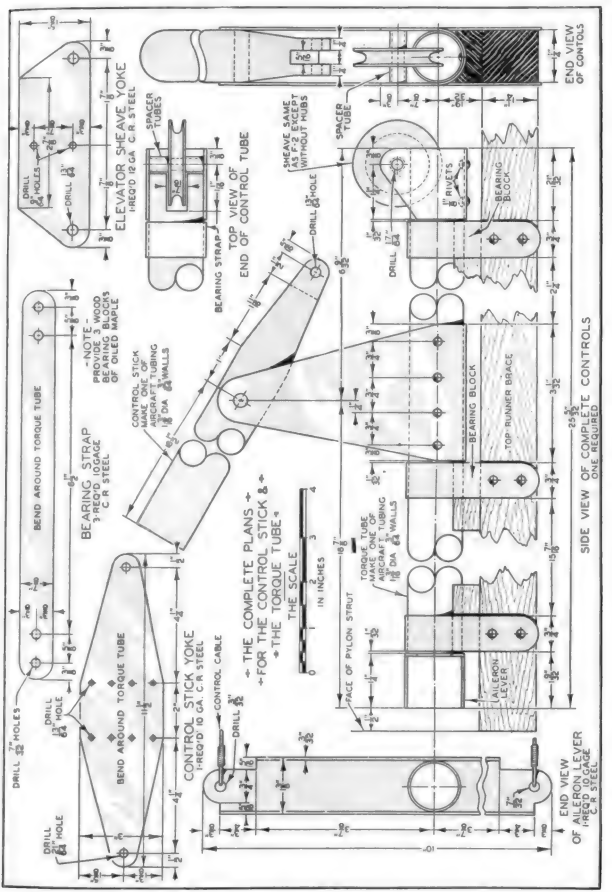
We paid off about five hundred feet of three-eighths manila rope, which was fastened with a readily releasable slip knot to the rear bumper of the car. The other end of the rope fitted loosely in the eagle-beak on the glider. Normally when the glider has reached the greatest height at which it can fly with any given length of rope, the eagle-beak is designed to drop the rope at the moment the peak altitude is reached. The slip knot was to be cast off at a jerk in case of emergency.

A wag of the arms from Shank, seated in the cockpit, signified all was set. I put the car into gear and headed for the south end of the field, 2,000 feet distant. Emery and Lloyd ran along the wing tips, as the rope tightened, and then faster and faster as I gave the Chrysler the gun. Golly, how that bus can travel in second! I went up to about thirty miles an hour as quickly as I could, and Jim, on the running board, said "She's off!"

Up in the air—better than a hundred feet in this shot! Pilot Shank is at the controls. This picture was snapped just after the glider let loose from the tow rope. An excellent idea of the wing spread is given by this photo.

All of a sudden I felt the car go easier, and quickly turned off to the up wind side. There, a hundred feet aloft, behind me, and sailing quietly like a great gentle bird, was the gull-faced M-M secondary glider I had


TOP LONGERON CLAMP
FITTING "H", 2 REQUIRED, OF #10 GA. CARBON STEEL. DRILL AS INDICATED
FITT. "K" 2 REQD. 10 GA. C.S.
LOWER LONGERON CLAMPS
FITT. "J" 2 REQUIRED 10 GA. C.S.
FITT. "L"
BRACE WIRE LINK
10 GA. C.S.
RUDDER BAR BRACE CLAMP
FITT. "M"
ONE REQD
10 GA. C.S.
VERTICAL STRUT
BEND
DETAIL OF RUDDER BAR CLAMP TO SHOW BENDING
TOP RUNNER FRAME
SPAR CLAMP
FITT. "R"
8 REQD. 10 GA CARBON STEEL
BRACE LUGS IN PLACE ON SPAR
SPAR BRACE CLAMP
FITT. "S"
6 REQD. 14 GA. C.S.
WING BRACE LUG
FOR FRONT SPAR
FITT. "P"
4 REQD. 10 GA C.S.
CLAMP WIRE-LINKS BETWEEN END NIBS OF LUGS
WING BRACE LUG
FOR REAR SPAR
FITT. "N"
4 REQD., 10 GA.C.S.
BUSH THE 9/32" HOLE IN EACH END OF FITT. "N", AND "P", TO TAKE 3/16" STEEL BOLT.



All essential construction details of control stick and torque tube are shown in the drawing above.

Showing Uncovered Tail Assembly

Figure 1. Orville Hickman is shown holding the various units of the tail assembly before they have been covered with fabric. His right hand holds the rudder while with his left he balances the stabilizer and elevator assembly.

designed. She floated to earth presently, and Gene kept her wings level by "flying" her with the ailerons until we could jump from the car and help steady her while he got out. He was all grins from ear to ear, was this famous young flyer.

"She's a pip!" was all he said. Which meant he had done his talking for that week. He acts, he does—he doesn't talk. Three words a week is his limit. "Yes," or "no" is a long speech for him. So we knew she was good, and ding-busted good.

Here is how she was built, and later on I'll tell you more about the fine points of flying her.

You will note that her design is simplicity itself, and here and now a few words will not be amiss to show you the whys and wherefores of her design so that you'll see why contemplated changes in any of the fancy work that goes on her should not be changed. Then too, I know the eds of this yere sheet will be glad if I forestall any questions.

The ship is a secondary glider. That means she is for students a trifle more advanced than the primary glider students. She is more advanced for the simple reason that she is more difficult to fly; you see she is more lightly loaded per foot of surface and per foot of wing span than say, the Northrop Glider, which design was largely drawn upon in making up my ship, for reasons of simplicity more than for anything else.

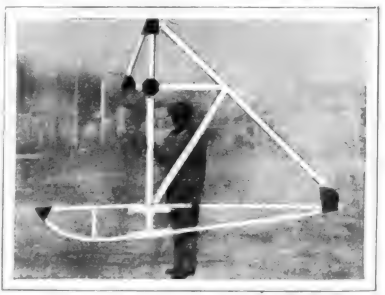
A secondary ship, being more lightly loaded than a primary type has different flying characteristics. One of them is the increased tendency to stall. A stalled glider is like a load of "pineapples" in the Hot Place.

Being lighter, a secondary ship floats more than a primary type, and is more sensitive on the ailerons. It is harder to land, harder to fly, easier to take off. It therefore, you see, requires more skill. It is more fun to fly.

It is just as easy to build. The little cockpit or nacelle is for the purpose of giving much greater aerodynamic efficiency, and is not difficult to build.

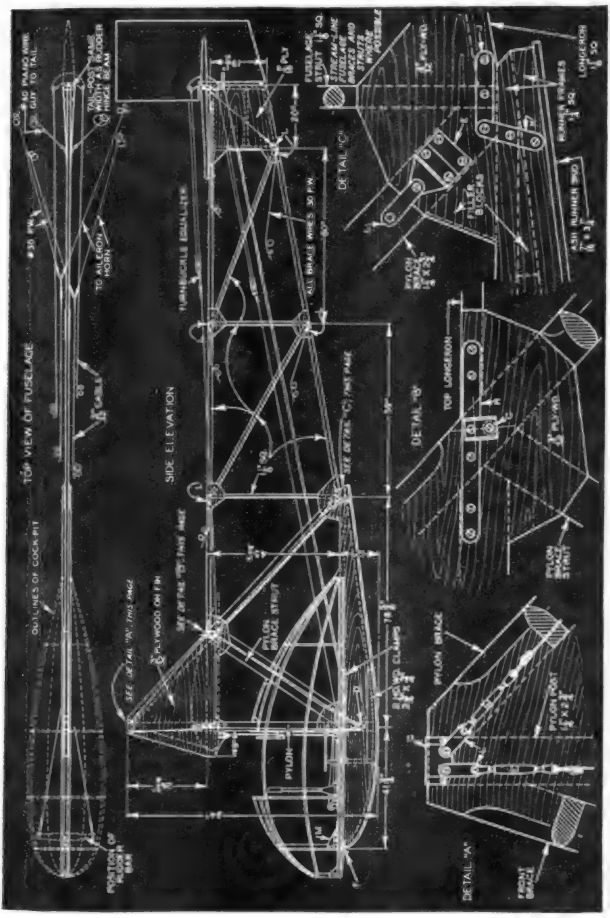
Of three bays, the fuselage is of the truss type. Plywood gusset plates on both sides of spruce struts, sized as the drawing on the opposite page shows keep the structure rigid.

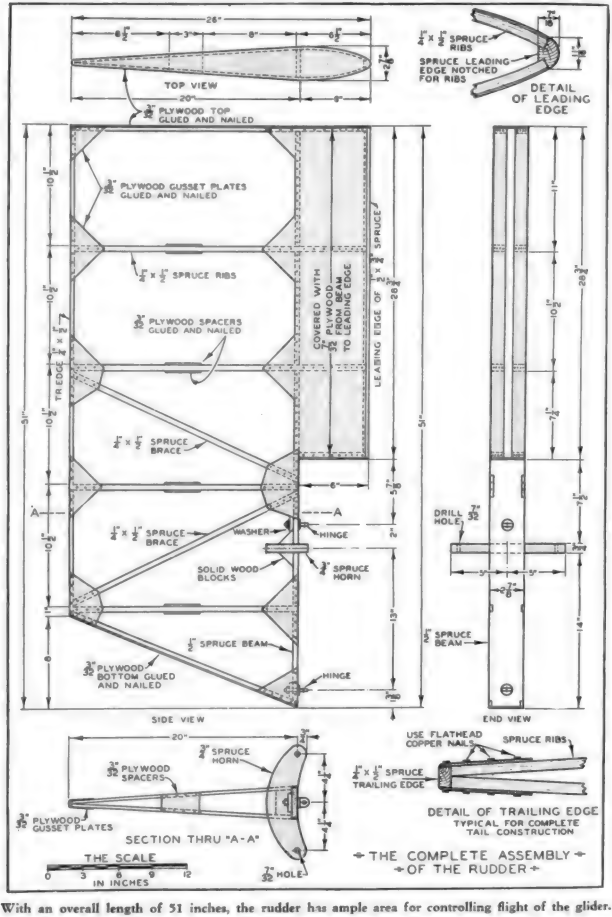
The first step in building the glider is the



The author holding a section of the fuselage which may be termed the heart of the glider. The cockpit is built up around this unit.

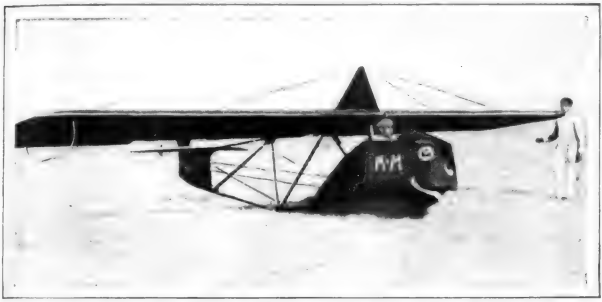
Fuselage Construction Details Included in the Complete Drawing Below





With an overall length of 51 inches, the rudder has ample area for controlling flight of the glider.

Good View of Glider Cockpit Is Shown In This "At Rest" Photograph

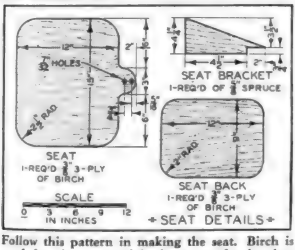


Down to earth after a nice hop. The face on the nose of glider was painted there by the author, and according to reports is supposed to represent a sea-gull—maybe you can see the likeness.

laying out of the seat frame shown in cut below. The dimensions for this piece are taken direct from the drawing and are put upon a piece of brown wrapping paper of a size sufficient to accommodate the lines. Then the pieces are tacked down, preferably through the wood itself with finishing nails to the floor or to the bench on which you are working.

Be sure that all the pieces of spruce butt up very closely. Do not rely on the gusset plates to take up the compression strains that result as of landing, and so on.

Then cut out the plywood gusset plates. These are of eighth-inch stuff as per the drawings. Put on the ones shown in Fig. 2 first. After these have been fastened then the large plates, shaped like a shoe horn, are fastened on.



Follow this pattern in making the seat. Birch is used for the seat and back, spruce for bracket.

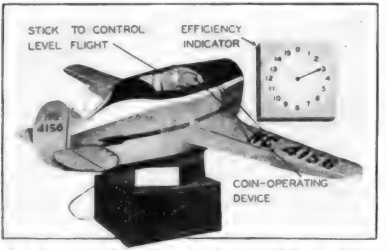
The manner of gluing is simple. Casco waterproof casein glue is used. It can be purchased in almost any hardware store. It comes in the form of a powder, and is mixed with a *definite proportion* of cold water. Like a cement, it requires setting to hold well, but, unlike the old hot gluing process, it requires no particular pressure to make it hold well. It is applied with a paint brush, and evenly to both surfaces to come into contact with each other. Then the piece is nailed down just enough to make the kiss even all around, and the thing is forgotten. The wood will part before the glue gives in.

The same method is used for the building of the wings and the control surfaces. The drawings being complete, carry all the dimensions, and to repeat that here would be superfluous. Suffice it to say that paper plan, full size, is made and laid over the workbench or the floor on which you are working, and that all the pieces are cut to size very closely before fastening.

You will note that the tail surfaces and rudder, as in Fig. 1, are very simple, and should be easy to build. The main spars are built first, laid over the drawing, marked for the rib spacing, then the cap strips on one side glued down and tacked. The job is flopped over and the second set of capstrips is put on.

Note: Part II of this glider-building article will appear next month.

Automatic Aviation Trainer Teaches Flying on Ground



If a movement of the plane is not corrected by the student within the time limit a mistake is recorded on the dial.

THE aviation trainer shown at the left was designed by Edwin A. Fink, of Binghampton, N. Y., for the purpose of reducing the cost of training pilots, but the device has proved such a novelty that it has proved to be a money-maker at amusement parks.

For the student flyer it provides a means for practicing correct control and developing that instinctive co-ordination of mind and muscle so necessary to the successful pilot without expense and danger.

The device consists of a miniature low wing monoplane, correctly constructed and equipped with standard controls. The plane is mounted on a universal joint on the base which conceals the mechanism which actuates the movements of the plane. These movements are exactly like the conditions of flying, and are corrected by the usual manipulations of the controls. Each mistake that is made in a given length of time is recorded on the efficiency indicator. The trainer is equipped with a coin operator for use at amusement parks.

Plastic Wood Comes in Tubes

PLASTIC wood composition is available in tubes. When a break or crack occurs, simply take off the cap, squeeze out enough wood composition, smooth into place and the break is repaired. It hardens upon exposure to the air, and will take on any kind of finish without showing the patch.

Checks Battery Automatically

WITHOUT removing the floor boards of the car, this little indicator, designed to be installed on the steering column or in the dash panel of the automobile, shows the condition of the storage battery at all times. Both the amount of water and the amount of charge in the battery are indicated on the same dial with one needle. The needle is luminous and can be read either night or day. The bracket and dial are chromium plated to conform with other instruments. There are two scales on the dial. The water level is registered on one and the amount of the charge on the other.

Silent Violin Makes Its Debut

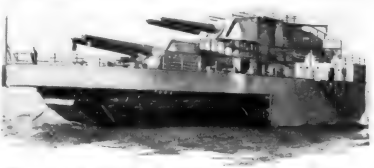
THE noiseless violin, which can be heard only by the person playing it, is the result of experiments by a German inventor. The instrument should be a boon to student musicians, who may now practice at any time without disturbing the neighbors.

Elimination of sounding board, leaving nothing but the frame, muffles the instrument.

Cameramen Make Realistic Scene With Fake Battleship

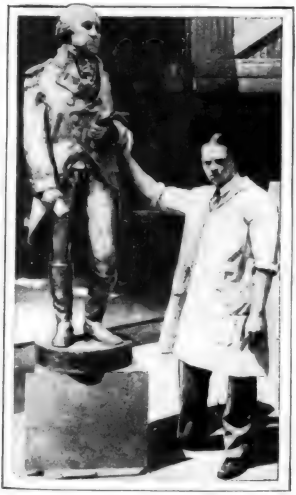
THE popular saying to the effect that the camera cannot lie may hold good in other parts of the world, but when it gets to Hollywood the cameramen there make a grand mess of it. For their business is to make a camera lie to the utmost of its ability.

In proof of this witness as a case in point the battleship in the photo at the top of the page. This incomplete battlewagon just dropped anchor outside of Los Angeles where cameramen will go to work on it to provide a realistic navy scene; and when they get through with their work, the picture on the silver screen will look real.



This incomplete-looking battleship was used by Hollywood cameramen as a realistic background for a navy scene.

Sculptor Models Statue from Pulp



This life size statue of George Washington was modelled from pulp made of old newspapers by George W. Cook, shown with his creation above. The statue weighs 22 pounds.

Ice More Transparent Than Water

PURE, clear ice is far more transparent to light beams than is pure unfrozen water, asserts an eminent engineer of well known lamp manufacturing company in commenting upon the ice illumination of Lake Placid. The reason is probably that the invisible molecules of water are in continual motion, so that they interfere with the light waves, whereas the same molecules frozen in ice are fixed in their places in the ice crystals.

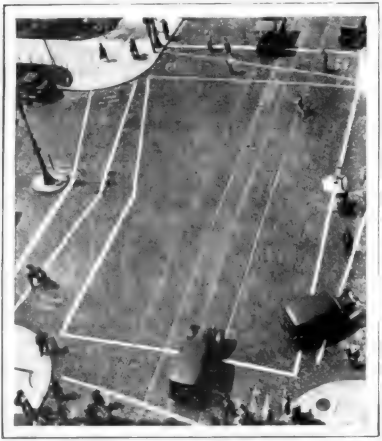
If the ice is absolutely clear the light passes through it without making the ice luminous. In order to create light effects and ornamental designs, the surface must be roughened with light blows of a hammer. This roughened surface immediately appears self-luminous, since the myriads of small, broken ice crystals catch the light rays and reflect them in every direction. The same effect may be produced by ice containing tiny air bubbles.

Injection Destroys Fag Nicotine

THE pernicious cigarette can no longer be accused of coating the lungs with nicotine, for a German chemist has discovered a chemical which, when injected in the cigarette with the syringe shown above, rids the fag of this harmful drug, and thus renders it harmless.

Nicotine in the cigarette is destroyed by an injection with the syringe as shown.

Philadelphia Stops Jay-Walking With Pedestrian Lanes



In order to lessen accidents, Philadelphia streets were painted to accommodate the movement of crowds, as shown above.

AN extensive program aimed at the prevention of jay-walking and lessening of accidents was started in Philadelphia recently and initiated by painting pedestrian lanes across the various important street intersections, as shown in the photo, in which several common violations of the pedestrian traffic rules are depicted for the purpose of demonstrating possibilities for accidents.

The lanes are painted to accommodate the movement of the crowds. The beginning of the lane is made wider than the rest to contain the group that usually collects to await the change of the traffic signals.

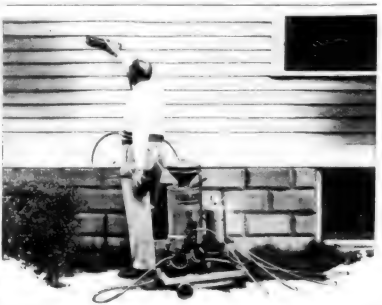
No Canals on Planet Mars

THAT there are no real canals on the planet Mars, but only illusions of vision perhaps based on a few cracks, rifts or other line-like markings, and that accordingly there is no evidence of intelligent life on that planet, is the belief of a famous astronomer.

Automatic Washer Cleans Painted Surfaces Quickly and Thoroughly

THE slow, toilsome process of washing off painted surfaces, tile, terra cotta, marble, stucco, etc., by hand is quickly going by the board, and machines, which can do the work quicker, more profitably and more efficiently, are being brought into service to perform the task. One kind of washer, which is being widely used, washes, cleans and rinses at one time, and thus does the work with a minimum of effort and time.

The action of the washer is entirely automatic. The cleaning compound, a specially prepared dry powder, is poured in the hopper at the top, and is fed from there as it is needed into the mixing chamber. Water is supplied to this chamber by means of a rubber hose.



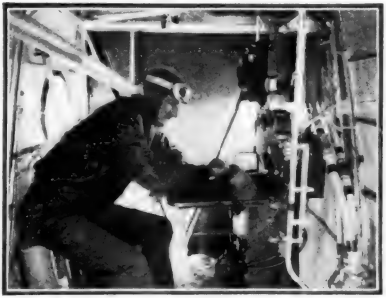
Cleaning painted surfaces is done quicker and more efficiently with this automatic washer. The powdered cleaning compound is mixed with water in the tank and fed to a mop in operator's hand. The action of the machine is entirely automatic.

SPARKS from the RADIO EDITOR

Edited by

L. B. ROBBINS

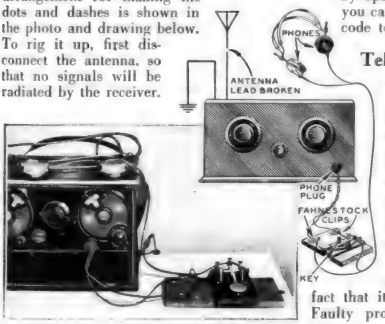
Modern Mechanics and Inventions is always on the alert to keep pace with the constant advance of radio and to learn the needs of radio fans. Mr. Robbins, editor of this department, is operator of station W1AFQ, and is widely known as an authority in the field of radio and telegraphy.



Learn Radio Code With This Simple Receiver Attachment

CODE practice is usually obtained by means of a buzzer, a code practice kit, or phonograph record played at varying speeds. But if you are a radio fan desiring to learn the code and have none of these means available, you can still obtain excellent practice right at the short wave receiver over which you listen to the signals of fellow amateurs. A simple, yet effective, little arrangement for making the dots and dashes is shown in the photo and drawing below. To rig it up, first disconnect the antenna, so that no signals will be radiated by the receiver. Then arrange a simple telegraph key on a baseboard, with Fahnestock clips and plug, using the circuit shown, in which the key is simply hooked in series with the phones.

To operate, put on the phones, place the plug in the detector jack, press down the key, and set the receiver to squealing with the regeneration control dial. When you release the key the squeal will stop. Thus by opening and closing the key circuit you can form the dots and dashes of the code to yourself and gain practice.



In this simple code practice set, the key is hooked in series with the phones as shown above to break the oscillation squeal into dots and dashes.

Telegraph Superior to Phone

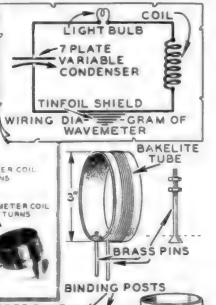
IN THEORY, the telephone should be the ideal method of long distance communication, owing to its greater convenience; yet after eight decades, or since the invention of the telegraph, nothing has appeared to replace code telegraphy as the most efficient method of transmission. This holds good in the field of radio as in that of landwire.

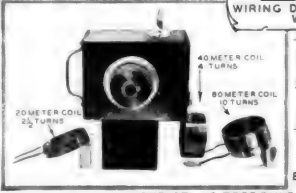
The chief reason for the superiority of code is due to the fact that it is more reliable and accurate. Faulty pronunciation, strange words and nervousness, which mar telephonic communication, are not met with in code. The telegraph message is precise and accurate.

A Long Distance Low-Power

by **L. B. ROBBINS**

Both voice and code can be sent over this low-power transmitter, which is ideally suited to the amateur because of its ease of construction and low operating cost.





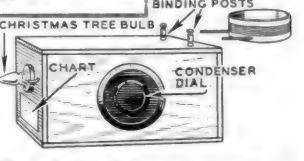


Fig. 1. Details of wavemeter construction are given above. The lead between the condenser and coil is grounded on the tinfoil shield as shown. The various coils are interchangeable.

Part II

LAST month, in the first part of this article, we described the main part of the "Robbins Long Distance Low-Power Transmitter." This completed, we can now proceed to construct the supplementary parts. The December issue, containing Part I, will be forwarded on receipt of 25 cents.

A frequency or wave meter is an indispensable part of any transmitting station; in fact, it is as essential to efficient transmission as a compass is to safe navigation. A practical and inexpensive meter, using a very simple circuit, is easy to build, and the parts can be picked for practically nothing.

First, procure a small box such as shown in Fig. 1, about 6x3½x5 inches in size, and having a hinged lid. Give the inside of the box a heavy coat of shellac, and while still tacky, press over it some clean sheets of heavy tinfoil, covering the entire inside. Mark out spots for the flashlight bulb socket, condenser, and binding posts, and cut these spaces out of the shield with a sharp knife. Next, mount an ordinary seven plate variable condenser on the inside, and a flashlight bulb socket and coil binding post on the outside. Do not allow any of the metal of the condenser to touch the foil, as this would result in a short circuit. A calibration chart for reference can be tacked on the outside, also.

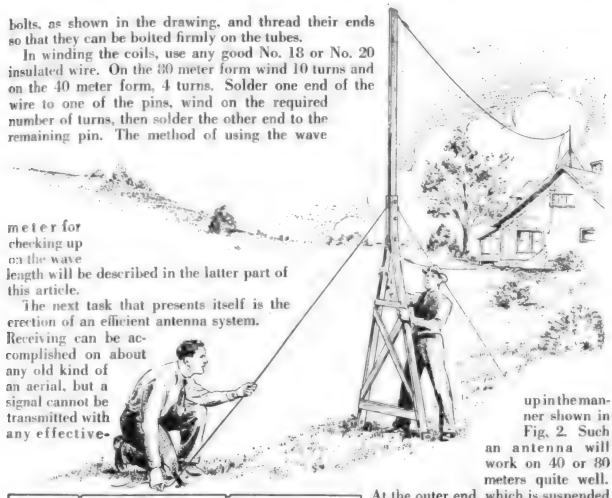
Wire up the wavemeter as shown in the diagram at the top of the page, again making sure that no metal touches the foil. The lead between the condenser and coil is grounded on the foil shield as shown.

You will need two coils—one for the 40 meter band and another for the 80 meter band. To make these, procure two hard rubber or bakelite tubes three inches in diameter and one inch long, and drill two holes in line with the edge, and as far apart as the binding posts on the wave meter case. Then form two pins of stiff brass wire or slender brass

bolts, as shown in the drawing, and thread their ends so that they can be bolted firmly on the tubes.

In winding the coils, use any good No. 18 or No. 20 insulated wire. On the 80 meter form wind 10 turns and on the 40 meter form, 4 turns. Solder one end of the wire to one of the pins, wind on the required number of turns, then solder the other end to the remaining pin. The method of using the wave meter for checking up on the wave length will be described in the latter part of this article.

The next task that presents itself is the erection of an efficient antenna system. Receiving can be accomplished on about any old kind of an aerial, but a signal cannot be transmitted with any effective-



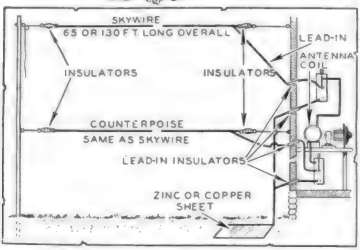


Fig. 2. Careful insulation of the antenna system is essential. The leads are brought into the house through lead-in insulators and hooked to the transmitter as shown in this drawing.

ness unless the antenna system is well constructed: that is, well laid out and well insulated.

The best antenna for beginners is a single wire, either 65 or 130 feet overall, strung up in the manner shown in Fig. 2. Such an antenna will work on 40 or 80 meters quite well. At the outer end, which is suspended from a mast or tree between 30 and 40 feet in height, is hooked a transmitting insulator. At the other end, hook another insulator, this coming just before the lead-in wire, which is soldered onto the skywire and run down through a wall insulator and into the house, where it hooks, via the lightning switch, onto the antenna binding post of the transmitter.

Now put up the second wire for the counterpoise. This goes directly beneath the sky wire, but high enough so one may walk under it. Insulate it also at both ends, and bring in a lead-in from the house end through another wall or lead-in insulator, and connect through another lightning switch to the ground binding post of the transmitter. In order to protect the transmitter from lightning, it is best to hook in the two grounding switches in series with the

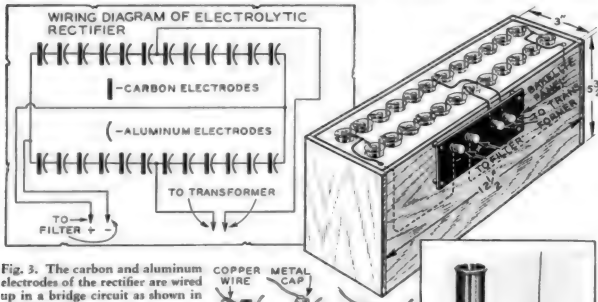


Fig. 3. The carbon and aluminum electrodes of the rectifier are wired up in a bridge circuit as shown in the above diagram.

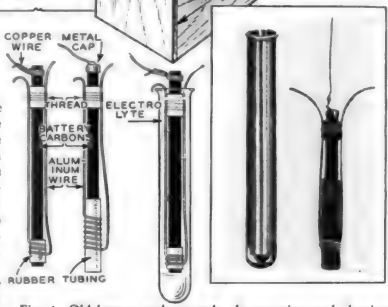


Fig. 4. Old battery carbons make the negative, and aluminum wire the positive electrodes. They are assembled as shown in the drawings and photo. 24 elements are shown, but 16 may be used.

antenna and the counterpoise leads as shown in Fig. 2. The lower poles of each of these are hooked to a wire running to a water pipe near by or to a sheet of zinc or an old hot water boiler buried in the ground. When the two switches are up they are in transmitting position; when down, the entire antenna is grounded against lightning. And, incidentally, run the lead-in insulators downwards from the inside, so that rain and snow will not be driven into the house.

Now that you have the transmitter, wave meter, and antenna system completed, you are ready to start thinking about the source of high voltage power for the plate of the transmitter. There are many possible sources for this, and you can choose according to the dictates of your bankroll. Five 45-volt heavy duty "B" batteries will furnish plenty of juice for a 201A tube. With average use, they will last about six months and give an absolutely pure DC note. Or, with lighting current available, you can use a high voltage "B" eliminator, such as used on many receiving sets. A 180-volt "B" eliminator is excellent for low power work. A direct current dynamo will also serve quite well, but they are rather expensive.

Perhaps the most inexpensive power source is an electrolytic rectifier, such as shown in Figs. 3, 4, 5 and 6. Such a rectifier takes the AC, which is boosted to about 500 volts by the power transformer, and changes it into DC. Such a current is absolutely necessary now a-days to conform to the Government Radio Commission's rulings.

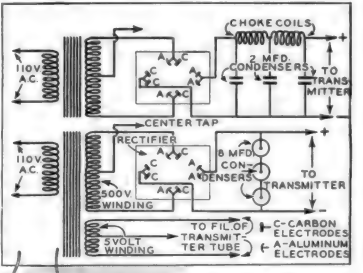
The first thing to do is to construct the power transformer. The winding form consists of a bakelite or fibre tube about six inches long and slightly over two inches in diameter, with a temporary flange placed on each end to prevent the windings from slipping off. The primary, which consists of 235 turns of No. 16 enamel wire, is wound on first. Wind the turns close together and tight, covering each layer with a piece of craft or other tough insulating paper. When the primary is completed, secure the two leads and wrap the windings with a layer of paper and a layer of tape.

If you plan on substituting tube rectifiers

for the electrolytic rectifier, you will have to have a 7½-volt winding for the tube filaments. If not, you can eliminate them. This consists of a 16-turn coil wound on over the primary, with a tap at the center, or eighth turn.

The five-volt winding is used to light the filament of the 201A transmitting tube. This winding is made of 11 turns, tapped at the center, or at 5½ turns, with the lead running out the side, as shown in Fig. 5. Both of these coils can be included in the same layer, with craft paper and tape wound over as before.

This much completed, the next task is to put on the high voltage windings, which consist of 1000 turns of No. 20 double cotton covered wire, tapped at the center, or 500th turn. A layer of craft or other insulating paper should be wound between each layer of wire, and the outside covered with both a layer of insulating paper and a layer of electricians' tape.



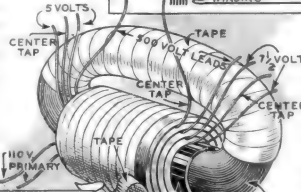


Fig. 6. Above diagrams give hook-up of transmitter power source, showing transformer, rectifier, and two different types of filter systems. Using three 8 mfd. condensers, no chokes are necessary to obtain pure D.C. Left—Drawing shows construction of power transformer.

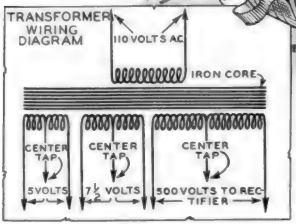


Fig. 5. The power transformer is wired as shown in the diagram above. Filament current is supplied by 5-volt winding. If electrolytic rectifier is used, the 7½-volt winding may be eliminated.

The core consists of a bundle of lengths of stove pipe iron wire forced tightly through the tube form, filling it as tightly as possible. Bend the ends of the wires up and over and mesh them together for two or three inches. Tie them together tightly with fine wire and tape the entire core firmly to prevent vibration. Lay the finished transformer in a shallow box and pour in melted wax taken from an old battery. Finally bring the leads out to convenient clips or binding posts arranged on the outside of the box.

The electrolytic rectifier used to change the AC into DC uses twenty-four cells, as shown in Fig. 4. However, since such a low voltage is used, the number can be cut to twelve or sixteen with as good results. You will need as many six-inch test tubes as you plan to use, as many carbons taken from old batteries, some aluminum wire, some short pieces of rubber tubing, and a few pieces of thin wood for the tube rack.

The rack is constructed as shown in Fig. 4. Holes are drilled in the top to accommodate the tubes and a strip of inner tube rubber tacked along the bottom as a cushion. Figure 4 also shows the assembled elements. A piece of rubber is forced over the carbon and a 12-inch piece of aluminum wire is wrapped around the center and run up the sides as illustrated. Do not allow this wire to touch

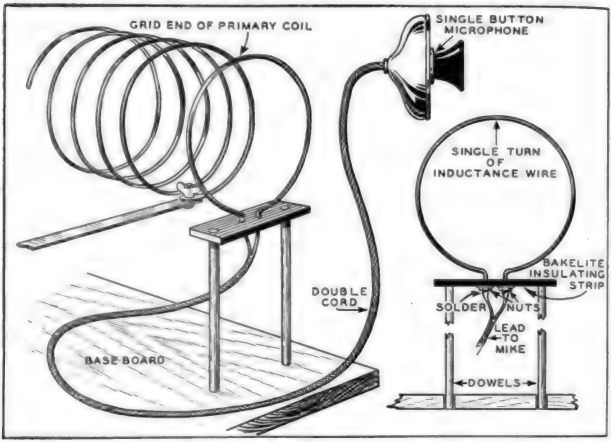


Fig. 7. For transmitting voice signals, a single loop of wire, supported as shown, is placed near the grid end of the coil to serve as a modulating system. The mike is hooked across the ends of the loop.

the carbon. Tie the two upper ends of the wire to the upper piece of rubber tubing and secure them firmly with several turns of thread. A short length of copper wire is wrapped around the top end of the carbon to serve as a lead which hooks to the aluminum wire of the next element. If shorter carbons with brass caps are used, solder a copper wire to the projection on the cap and use a longer piece of rubber at the bottom, wrapping on a few extra turns of aluminum wire to use up the full twelve inches.

The bridge type of rectifier is used here. Connect the aluminum electrode of one cell to the carbon of the next along each row, as shown in Fig. 4. Then connect the two carbons together at the lower end of both rows, and the two aluminums at the upper end of the rows. The lead from the aluminum is marked plus and the lead from the carbon, minus. The leads between the two center cells of each row are tapped and run to the transformer output. As aluminum cannot be soldered, connections must be made by clips or by twisting the wires together tightly.

The electrolyte with which the tubes are filled consists of the following ingredients:

Ammonium citrate - -	425 gms.
Citric acid - - -	368 gms.
Ammonium phosphate -	150 gms.
Potassium citrate - -	8 gms.
Distilled water - -	1000 gms.

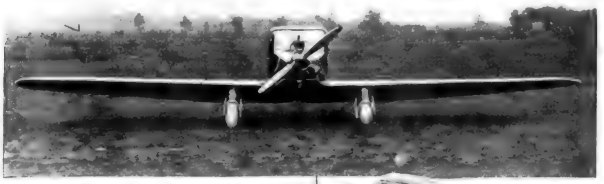
Mix this warm and dissolve all ingredients thoroughly. Fill each tube to the top of the upper rubber, as illustrated in Fig. 4.

Forming the aluminum takes about three minutes. In forming, the transformer leads are connected to the rectifier input, and the rectifier output wires connected. Then the transformer can be plugged in without danger of blowout. After forming, the rectifier is ready to connect to the filter.

Either of the two filter systems shown in Fig. 6 may be used. In these the center tap of the transformer winding is left unused. In the first system, three 2 mfd. filter condensers are shunted across the filter output, one at each end of the two choke coils, and the other at the center terminal as shown.

(Continued on page 194)

A Plane That Always Lights on Its Feet



This front view shows how the wings set close to the ground when the machine is at rest, little more than clearing the landing wheels.

The side view shows the construction of the high cabin and the unusual tail assembly.

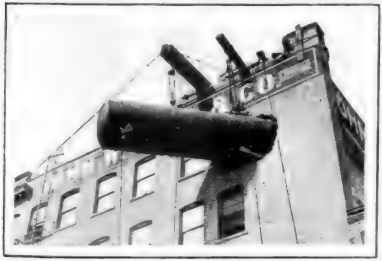
THE Stabilairs plane which successfully passed recent tests, is the product of designs by Albert J. Downes of Salem, and Allen H. Knight of Danvers, Mass., both of whom have been connected with aviation since before the war.

The plane is of special interest because it has no control type elevator, horizontal control being effected by a movable stabilizer mounted on the extreme rear end of the cabin fuselage. This stabilizer is shaped like the blade of a turf-cutting spade, the shape being a material factor in deflecting the wind.

Outstanding features of the craft are that it can be maneuvered more easily than the conventional type of plane; that it cannot be forced into a spin; that it will not fly on its back; and that it will not dive beyond a certain speed without coming out of the dive itself. The center of gravity is placed forward of the center of pressure, which prevents the spin.

The ship has a high speed of 90 miles an hour and a landing speed of 37.

Hole Cut in Ten-Story Winnipeg Building to Admit Belated Boiler



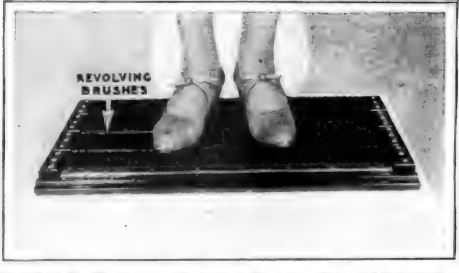
This shot, taken from a building across the street, shows how booms had to be rigged over the edge of the roof.

YOU'VE heard about the fellow who built an airplane and a boat in his basement during the winter, and then had to tear out the side of his house to get them out. But here's a new one.

After a ten-story building in Winnipeg, Canada, had been completed, it was decided to place a ten-ton boiler in the top story. That made it necessary to tear out a section of the wall which had just been completed and raise the boiler by means of a cable and pulley suspended from the roof. The job was accomplished without an accident.

MECHANICAL AIDS for

This electric coffee roaster was recently demonstrated in London, England.



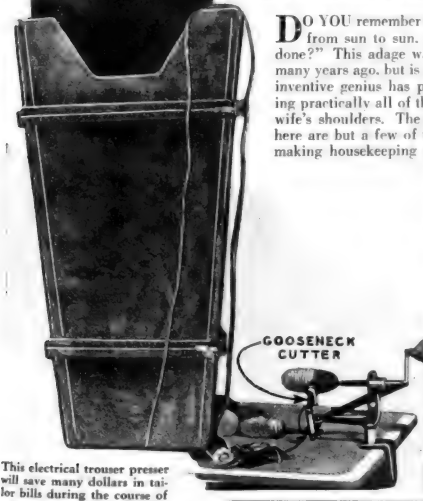
Instead of the fiber mat usually seen at doorways, this mat has movable brushes, and when stepped on sends the dirt to the pan beneath. Brushes rest on a grate, and when worn out may be cheaply replaced with new ones.

Instead of the oiled dust cloth there is now on the market a soft, pliable paper impregnated with polish which dusts, cleans, and polishes all at once. It comes in a long roll, from which the housewife can conveniently tear off a section to do her dusting.

the BUSY HOUSEWIFE

This improved dual pan waterless cooker steams vegetables without destroying their valuable vitamin content.

DO YOU remember the old saying, "Man works from sun to sun, but woman's work is never done?" This adage was written by a philosopher many years ago, but is quite passe now, for modern inventive genius has perfected devices for removing practically all of the drudgery from the housewife's shoulders. The handy time-savers pictured here are but a few of the many devices which are making housekeeping a pleasure.



This electrical trouser presser will save many dollars in tailor bills during the course of a year, for it enables the wearer to keep his trousers always in presentable condition himself at a cost of about two cents per press.

Potatoes are said to peel themselves with the Nu-Way peeler above. It is only necessary to place a spud on the machine and turn the handle. The cutter automatically follows the contour of the tuber at an even depth. Shoe string potatoes may also be cut with the machine.

Motorist-Writer Builds Shelf for Typewriter in Her Car

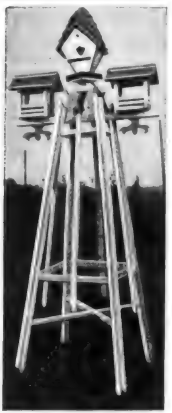
By constructing a fold-away shelf in her car for holding the typewriter, Velva Darling, above, is able to write while riding.

FINDING that writing notes while traveling proved impractical, if not impossible, with a pencil, Velva Darling, well known newspaper columnist, installed a portable typewriter shelf under the dashboard of her car to jot down any ideas for stories or notes that might come to her while riding. When not in use the typewriter can be folded back under the dashboard, so that it is completely out of the way.

Previous to the installation of the typewriter, Miss Darling would write her notes with a pencil, but when she came to read them after the trip she found them illegible, and consequently many a good idea or story was lost. The shelf, however, has solved the problem.

Attractive House for All Birds

IF YOUR heart goes out to the sufferings of birds of all kinds and you want to shelter them regardless of their breed, you will find this unique bird house just the thing to satisfy your altruistic instincts. The house is built in three units, and has in addition two shelters in which robins and swallows may build their nests. Some birds seem to prefer four-sided houses while others, being more fastidious, prefer three-sided ones. So that when Mr. and Mrs. Bird are out looking for a flat, they are sure to find, if they alight on this house, an apartment to suit their needs. Exclusiveness is thus not one of the house's features. The builder of the house constructed it entirely from scrap lumber in his workshop.



This unique bird house attracts all kinds of birds.

"Table Golf" Played Like Pool

The score in this new game, called "Kue-Golf," is determined by pocket into which ball falls.

THE latest game to be devised for the amusement of golf fans is called "kue golf" and is played upon a specially constructed table, as shown in the photo above. Using a billiard cue, the player shoots the ball so that it falls into a numbered pocket, each of which gives a certain score to the player.

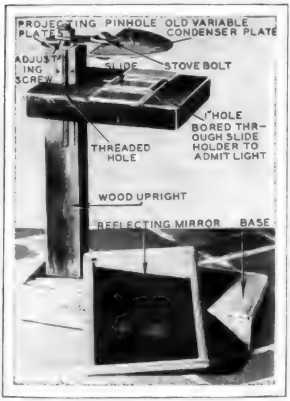
HOME WORKBENCH

Edited by
A. NEELY HALL

In the pages of this department you will find plans for the construction of many fascinating and inexpensive devices. Mr. Hall, editor of Home Workbench, is the author of many books on handicraft subjects and is recognized as authority in his field.

Novel Water Lens Microscope Reveals Tiny Plant Life

IF YOU would like to take a fascinating journey into a drop of stagnant pond water and see the strange life that exists there, you will find that there is no more inexpensive conveyor than this ingenious microscope, which uses a simple drop of water for a lens.



A drop of water placed in the pinhole of the condenser plate serves as the microscope lens.

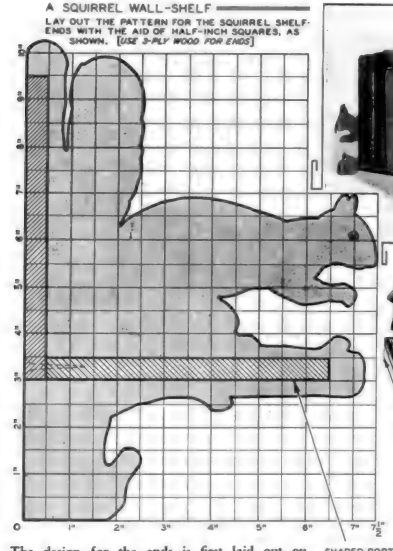
The essential parts of this microscope are the stand, the eye-piece, and the slide and adjustable slide holder. The eye-piece consists of an old aluminum variable condenser plate which has a hole the size of a large darning needle drilled through it, as shown in the accompanying photo. This eye piece is bolted to a projecting plate that has been screwed to the top of the wooden upright.

The adjustable slide holder is a piece of rather thin wood with a one-inch hole bored through the center as shown, and a square notch cut in one side, so that it will fit over and slide along the wooden upright. Adjustment is effected by means of a long stove bolt which passes through another projecting plate on the top of the upright and then down through a threaded hole in the slide stage.

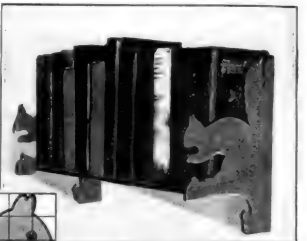
If possible, it is best to use regular microscope slides and cover glasses. Failing this, a strip of window glass with rounded edges can be used, together with a circle of thin glass for a cover.

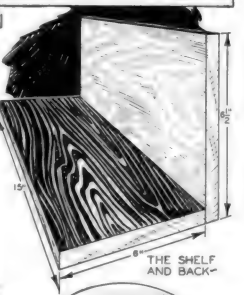
The lens is made by placing a drop of clear water in the smoothed-off hole in the eye-piece. Do not use too much water or the lens will sag and run over the edges. In examining any substance, place it on the slide, cover it with the cover glass, focus the mirror on the slide, and bring into focus with the adjusting screw. A little practice and experimentation here will make perfect.

This Easily-Made Wall Bookshelf Has Ornamental Ends



The design for the ends is first laid out on squared paper, as shown, then traced on wood.





The completed wall shelf is shown above. The ends, made of 3-ply wood, and shaped like a squirrel, are glued to the shelf and back boards.

ONE way to take care of the pile of books that usually litters up the library table is to build this simple, but very ornamental wall shelf, which has ends fashioned like squirrels. The back and shelf is ½-inch hardwood, cut to the dimensions shown in the accompanying drawings, while the ends are 3-ply wood.

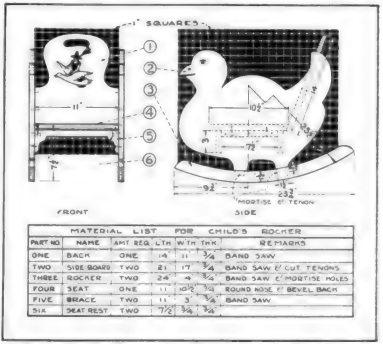
In cutting out the end pieces it will be necessary to lay out the design with a sheet of squared paper as illustrated above. This done, merely trace the design on the plywood and cut out with a coping saw. Next give the pieces a smooth finish with fine sandpaper, rounding the edges so as to add to the lifelikeness of the figures.

The back and shelf pieces are fastened together with screws and also given a smooth finish with sandpaper. Care should be taken to see that the ends are even. Finally, glue on the end pieces as shown and finish in any manner you desire. The completed shelf can be fastened to the wall with hookeyes or long screws through the back. Such a shelf will support ten or twelve books easily.

Ornamental Rocker Makes a Fine Child's Christmas Gift

WHILE you are busy building writing desks, book cases, table lamps, and what not, don't forget to include something for the children, for they enjoy things, too. A child's rocking chair, such as described herein, which is practical as well as attractive, and easy to build, will make a Christmas gift that will please them immensely.

The first step necessary in the construction of this chair will be the joining together of the boards that are used to make the parts specified in the drawing at the top of the page. The joining is accomplished by planing the edges of the smaller boards perfectly true and square, and then gluing and clamping them together edgewise. They must remain in the clamps until the glue is firmly set—usually about 48 hours.



MATERIAL LIST FOR CHILD'S ROCKER

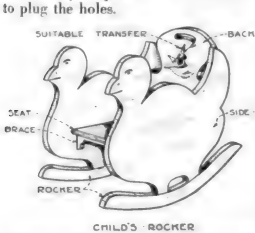
PART NO.	NAME	AMT REQ.	LTH.	WITH	THK.	REMARKS
ONE	BACK	ONE	24	11	¾	BAND SAW
TWO	SIDE BOARD	TWO	21	17	¾	BAND SAW & CUT TENONS
THREE	ROCKER	TWO	24	4	¾	BAND SAW & MORTISE HOLES
FOUR	SEAT	ONE	11	10½	¾	ROUND NOSE & BEVEL BACK
FIVE	BRACE	TWO	11	3	¾	BAND SAW
SIX	SEAT REST	TWO	7½	¾	¾	

The designs for the side and back boards are traced out and the various parts assembled as illustrated in these drawings.

In making the side and back pieces, you will have to mark out the designs on squared paper and then trace out the pattern on the wood. When this task is completed cut out the design on the board with a bandsaw.

The mortise and tenon joints which join the sides to the rocker pieces are ¾ inch deep, ½ inch wide, and 1½ inches long. After being glued, they are reinforced with brads.

The wooden strips which support the seat and the backboard are fastened to the side pieces by means of screws put in from the outside and countersunk to a depth of ¼ inch. Putty or plastic wood should be used to plug the holes.



The completed rocker, shown in drawing above, is very serviceable, and attractive in design.

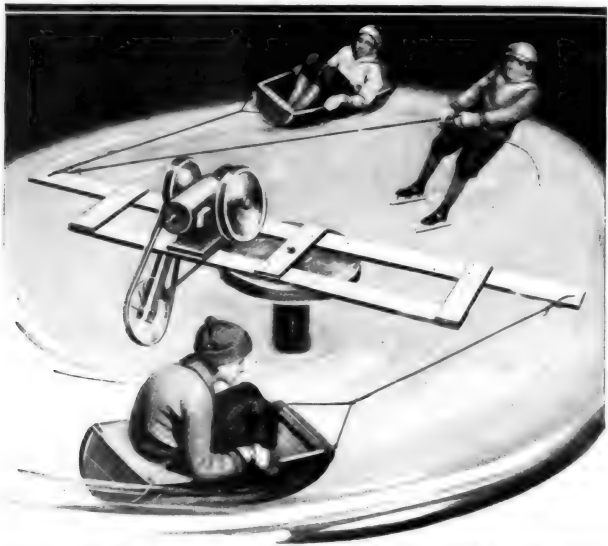
The chair, though now fully assembled, still remains to be sandpapered and painted. It is suggested that the worker use a quick drying enamel, as it covers the surface well and dries within a few hours, leaving a hard, glossy finish. For ornamentation, paint some attractive cold water transfer design on the seat back.

New Flexible Wood for Interiors

A NEW kind of flexible wood has just been put on the market which will undoubtedly have a great influence in the field of interior decorating. It is not in any sense an imitation or wood substitute, but a real wood veneer, mounted permanently on stout cloth, and as pliable as a piece of leather.

As a substitute for paneling and wall paper, it cannot be surpassed. Ordinary paper hanger's tools will serve well enough for applying it to walls. Unusual and strikingly beautiful effects, almost impossible to achieve with any other form of quartered wood, can be secured with this new product. The grain of the material is the matched grain of the tree, and by the use of matched sheets, a grain effect of unusual charm can be produced. And the material, being flexible, also has the advantage that it can be applied to small and inconvenient places.

Ride This Ice Merry-



This easily built Ice Merry-Go-Round is a new winter sport without an equal as a thrill producer.

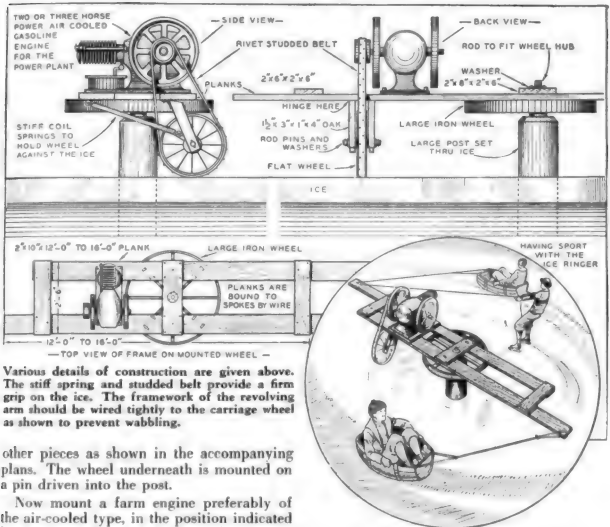
by DALE R. VAN HORN

Speed is the chief source of thrills in winter sports. If you can lay hands on an old two-horsepower gas engine, you can construct this novel Ice Merry-Go-Round and get a real thrill as it whizzes you at top speed in circles around the ice.

IF IT'S thrills you are looking for in winter sports, set up an Ice Merry-Go-Round such as pictured on the cover of this issue and you will get all you are looking for. Not that it's dangerous, for it isn't. But you can hook your sled or the special half barrel sled shown in the picture, and spin around and around on the ice at a breath-taking speed. Or, if you are a skating fan, you can hitch onto one of the arms with a rope and whizz around in large circles on the lake.

The first thing to do is to mount a stout post through a hole in the ice, setting the lower end down into the bed. Then pack snow and ice around it at the ice level and pour water over it to make a solid frozen base. Next make a frame of two planks spaced about two feet apart and held together by two

Go-Round for Thrills



Various details of construction are given above. The stiff spring and studded belt provide a firm grip on the ice. The framework of the revolving arm should be wired tightly to the carriage wheel as shown to prevent wabbling.

other pieces as shown in the accompanying plans. The wheel underneath is mounted on a pin driven into the post.

Now mount a farm engine preferably of the air-cooled type, in the position indicated by the dotted lines at the top. Underneath, fasten two short hardwood arms by means of hinges, and between them set an iron wheel with flat rim. The axle can be an iron rod with washers on each side of each wood arm, and with pins through the ends to hold it in place. The wheel need not be keyed to the shaft.

To hold this wheel firmly against the ice at all times, connect two stiff coil springs between the lower arm ends and the other plank as shown in the drawings.

Now between the engine drive wheel and this lower wheel run a belt studded with a number of copper harness rivets. These studs provide a positive grip on the ice and insure no slipping.

To make a better connection between the frame and the large wheel mounted on the post, set one cross piece directly over the hub, bore a hole for the top of the rod through its center, then set a large washer over this, fastening it down with nails or screws. This makes a firm bearing and prevents wear.

The sleds used are made by cutting a vinegar barrel in halves, lengthwise. Cut the ends of the hooks a little long, then bend these over and nail down to the edges of the staves to keep the staves and barrel held tightly together. Finally, tie these to the ends of the horizontal arms with ropes from 10 to 25 feet long, depending upon the length of the planks used.

Greater fun can be obtained by running four ridges of wetted snow equidistantly apart, from the center post, outward. Round these off on the tops and smooth down before permitting to freeze.

Wastebasket With Modernistic Lines Makes a Fine Gift

The completed wastebasket is shown in this photo. Note the simple, modernistic lines.

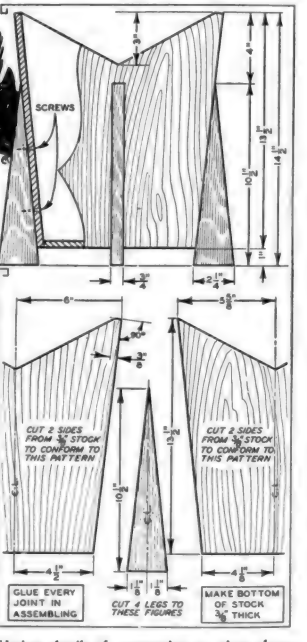
YOU will make no mistake in including a waste basket or two in your Christmas workshopping list, because it is an article of which there can never be too many in any home. Here's one which will be liked for its modernistic lines, and which will give a pleasing touch of color to any room.

The sides and bottom of the wastebasket are best made of 3-ply basswood, which your local dealer will supply. Failing this, you can make the sides of hard surfaced wallboard, and the bottom and brackets of ¾-inch stock. If wall board is used, however, the corners will have to be reinforced with strips of wood ½ inch square, which are glued in the corners.

Lay out the sides by the patterns shown in the accompanying drawings. A sure-fire method of getting a symmetrical job, which is extremely necessary, is to make a one-half templet of each of the two sizes of sides, then reproduce their outlines to the left and to the right of center lines.

The leg strips have the same pitch as the basket sides, and are glued and nailed to the center of the sides. To make the bottom board, cut out the piece to size, bevel off the edges slightly, and secure it in place with glue and finishing nails. The sides, too, are fastened together with two penny finishing nails, after it is made certain that the corners are square. To make a neat, workmanlike job, this last point is absolutely essential.

With the basket assembled, set all nail holes, trim off the top edges and corners, fill the nail holes and any imperfections that you may discover with plastic wood or putty, and give all surfaces a thorough sandpapering. Then finish with two or three coats of green or red lacquer or enamel, rubbing down between coats with fine sandpaper. As modernistic furniture leans to simplicity, no ornamental designs are necessary.



Various details of construction are given above.

Winners of Flying Contest No. 12

A Free Flying Course, helmet and goggles go to winners in Modern Mechanics and Inventions' big aviation contest.

FROM the way these second and third prize winners have been coming back later and winning the big prize, you would think that we had been awarding them spurs instead of helmets and goggles, for it seems that the runner-up trophies have a way of spurring to greater efforts their recipients.

Earl Marcoux, who came through with a mighty good entry in Contest Number Ten, fairly stood us on our respective ears with his latest artistic efforts. His 27-page leather bound book containing the answers to the twelfth set of questions was so far ahead of anything yet received in this or any previous contest that it would have been impossible to award the free flying course to anyone else. Earl says in part, "I am more than willing to gamble a few hours of my spare time for a chance at the free flying course." We are willing to gamble that he spent more time in preparing his entry than he will in the air at our expense, and that means more than ten hours. How many of you who failed gave the matter even one hour of your time?

James McLean, Jr., of 1245 Central Ave., Memphis, Tenn., was awarded a real leather helmet as second prize, while Dorothy Steger, who lives at 906 Oakton Ave., Evanston, Ill., won a pair of aviator's goggles for the third award.

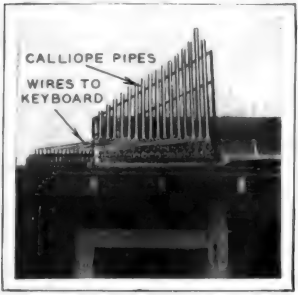
Others who deserve honorable mention are: Edward W. McClure, Los Angeles, Cal.; C. A. Waggoman, Fort Worth, Tex.; Wilfred R. Wagner, Omaha, Neb.; George Bird, Highland Park, Mich.; William McKee, New York, N. Y.; Lillian M. Greene, Missouri Valley, Iowa; Stanley V. Olsen, Duluth, Minn.; Cecil Neely, Stillwater, Okla.; J. H. Dubuque, Richmond, Va.; Elmer Zelsman, Wichita, Kan.; Fred G. Seidel, Taftville, Conn.; Felix Stroud, Toronto, Ont.; Leo G. Russell, Oshkosh, Wis.; Antonio Lamberti, Chicago, Ill.; Howard G. Tomer, New Brunswick, N. J.; Ralph Krasky, Minneapolis, Minn.; William Brumsby, Hicksville, N. Y., and Oris Gates, Dunedin, Fla.

Earl Marcoux, whose address is Box 116, Mosinee, Wis., wins the twelfth free flying course.

James McLean, Jr., 1245 Central Ave., Memphis, Tenn., is awarded a real leather aviator's helmet.

Dorothy Patience Garnett Steger, of Evanston, Illinois, wins a pair of aviator's goggles.

Farmer Rigs Up Calliope to Call in His Workers to Dinner

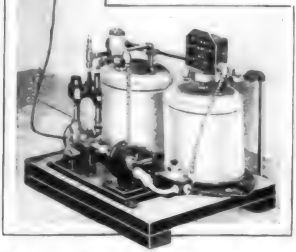


Mounted on the barn, this calliope is used by a farmer to call in the workers from the field.

A WESTERN farmer with musical predilections thought up the idea of having a tuneful calliope on the barn to call in the hired men from the fields to dinner. Obtaining the parts from the usual source, a mail order house, he set to work building the mechanism. Control wires were run down through the roof to the wooden keyboard below. Air pressure for power was piped in, so to speak, from the air tank on his water supply pump. A combination of notes has been devised to give a signal for emergency call, fire call, foreman call, etc.

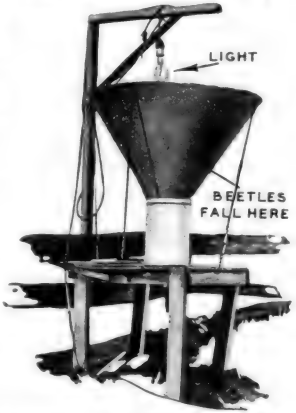
A Home Gas Manufacturing Plant

RESIDENCES located in remote places where gas from city mains is unavailable can now be supplied with gas from a home fuel manufacturing plant which has recently been put on the market. The machine consists of a generator and compressor which is placed in the basement and a large tank, buried in the earth outside the house, which contains a supply of liquid gas from which the fuel gas is made. When properly blended with the oxygen of the air, the liquid becomes a non-condensing fuel of high heating efficiency and burns an odorless flame.



Fuel gas can be made at home with this gas plant.

Light Attracts Beetles to Trap



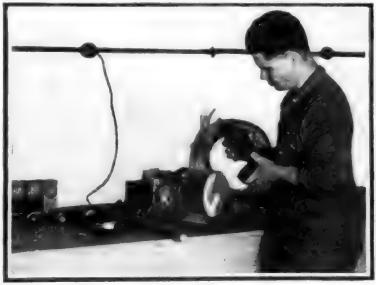
Beetles flying at night towards the light strike the funnel walls and fall captive into the receptacle.

IN STUDYING the Asiatic garden beetle, which is such a destructive garden pest, entomologists of the U. S. Department of Agriculture found that these insects lie hidden in the grass in daytime, that they come out at night, and that they are extremely fond of light. So as a means of combating them, they devised the trap shown in the photo above. The trap proved highly effective, for in a month's time 158,000 beetles were caught in one trap alone. In the test, traps were placed one to an acre.

AMATEUR ELECTRICIAN

Edited by
THEODORE ALLEN

For the practical minded, the mysterious force of electricity offers many adequate solutions for every day problems. This month, Mr. Allen presents plans for making serviceable electrical contrivances that will aid you immensely in performing everyday tasks.



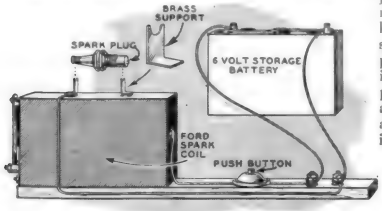
Ford Coil Makes Simple, Handy Tester for Spark Plugs

FOR testing spark plugs, there is no more efficient, and at the same time more simple, device than the tester shown in the drawing at the bottom of the page. All that is needed to construct such a tester is an old Ford spark coil, a wood baseboard on which to mount the parts, a push button, two strips of fairly thick sheet brass and a few bolts and nuts. Current can be supplied by four ordinary dry cells, or a six-volt storage battery—the same battery you use in your car.

The Ford coil, the pushbutton, and the screws are mounted on the baseboard as illustrated in the drawing. As binding posts, the two stove bolts are used. These are put in from the bottom so that they project up through the top of the board. The wires running to the push button and to the terminal on top of the spark coil are bolted under the first nuts, the wires running to the battery posts, under the second nuts. It is advisable to use washers along with the bolts to avoid pinching the wires. A good grade of glue will serve to hold the coil firmly to the baseboard.

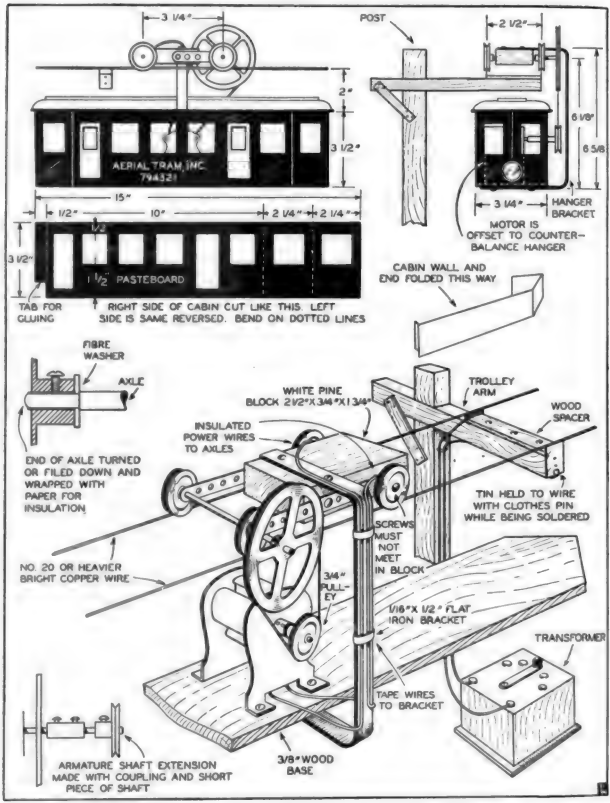
The two brass strips are cut and bent as shown in the drawing to serve as a holder for the spark plug. These brass pieces are soldered to the terminals on the top of the coil at a distance slightly less than the length of the plug.

Before testing a plug, make sure that the spark coil is in good condition. Some adjustment of the vibrator may be necessary before a rich spark can be obtained. This done, hook the storage battery to the binding posts, place the plug to be tested in the brass rests, and press the push button. If the plug is good a spark will jump continuously across the points. If it is defective it will jump above the points to the body of the plug. If useless, there will be no spark at all. Using this device, the plugs can be tested rapidly—as fast, in fact, as you can take out one plug and put in another. Any type of plug can be tested.



The parts of this simple tester are mounted and wired up as shown above. In testing, the plug is placed in the brass holders.

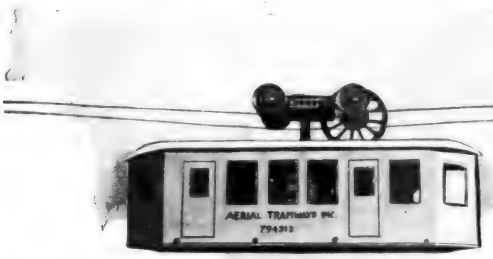
Electric Motor Runs



These detail drawings of the aerial tramway are so clear that the accompanying text is almost unnecessary. All essential dimensions are given here, those omitted being immaterial. Note wiring arrangement.

Aerial Tramway

by HI SIBLEY



Here is a photograph of the completed car speeding around the wire track.

This miniature electric tramway is a real novelty in the line of home-built toys. Using an inexpensive motor which may be purchased in any department store, it may be run on your house current with a step-down transformer.

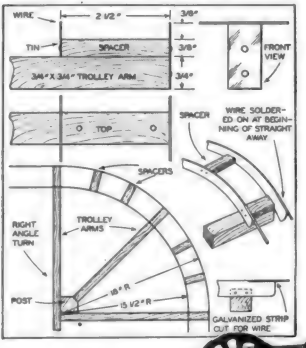
AN AERIAL tramway, run on ordinary house current, is easy to build, while the size of the track is limited only by the amount of space you will have at your disposal in which to erect the toy. A few parts obtained from a "Meccano" set and an inexpensive step-down transformer are all that you need to buy. Wire, wood and cardboard will be found around most home workshops. It will not even be necessary for you to purchase your transformer, as plans and instructions for building an excellent one are contained in the October, 1930, issue of Modern Mechanics and Inventions.

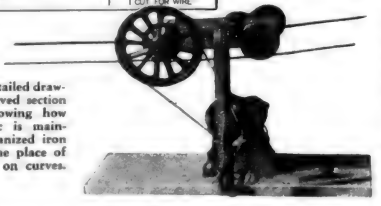
The power-plant of the tram car is a small electric motor which is standard equipment in all full "Meccano" sets. If you don't have such a motor and don't want to buy the entire set, the motor may be purchased separately from any department store toy counter. The pulleys and metal parts for the trolley carriage are also parts of a "Meccano" set, but it is not absolutely necessary to use these parts, as your ingenuity will probably suggest a home-made substitute.

Let us start our work by taking up the details of the car. For the base we will need a piece of $\frac{3}{4}$" board cut to a width of $3\frac{1}{2}$" and a length of $13\frac{1}{4}$". From each end of the baseboard measure $1\frac{5}{8}$" and mark, then find the exact center of the width at each end, and saw off from here to the points marked. This will give you the pointed ends which will fit the cardboard body to be cut later.

Next take a piece of $\frac{1}{2}$"x1/6" strap iron $13\frac{3}{4}$" long and bend it as shown on the opposite page. This is your hanger bracket. This should be screwed to the center of the base and the motor mounted over it and offset so as to counter-balance the weight of the hanger.

And now for the trolley carriage. It is well to assemble this part before mounting it on the hanger bracket. The drawing of this detail is so clear that a written explanation is perhaps superfluous. The trolley wheels are merely the $\frac{3}{4}$" pulley wheels found in "Meccano" sets, but will require a little extra work because they must be insulated. The ends of the axles should be filed down and wrapped with paper, and a fibre washer should be placed on the axle so that the metal of the shoulder will not come in contact with the wheels. Care should be taken that the screws are not turned so tight that they extend





Above is a detailed drawing of a curved section of track showing how an even arc is maintained. Galvanized iron strips take the place of copper wire on curves.

through the paper insulation. They will hold firmly against the paper if care has been taken in wrapping the axles.

Now that the carriage is assembled it may be mounted on the under side of the hanger bracket, after which the pulleys may be hooked up and the wiring installed. Ordinary bell wire is best for this. The ends of the wire are hooked to the axles of the front wheels and the strands taped to the hanger bracket as shown in the detail drawing, where they are connected with the motor.

Next the body of the car is cut from cardboard according to the plan. If the base and sides have been cut accurately they will be found to match perfectly and may easily be tacked in place. The easiest kind of a top to make will be a flat piece of cardboard cut to shape, but if a more elaborate job is desired, paper may be stretched over a curved wire frame. Here is a chance to use your ingenuity. The car, of course, should be painted and lettered as your fancy dictates.

Now all you have to do is place your pulley cord and the car is complete.

Now we are ready to construct the overhead track. As no two readers will have the same ideas of where they want their railroads to run, we have left much of this detail for you to figure out. But with the instructions offered here, it will be possible to rig up almost any length of trackage, with as many twists and turns as you care to think about.

As the tracks are of copper wire, it will be necessary to have a trolley post about every three feet so that excessive sag will not develop under the weight of the car. The distance between posts is, however, elastic. The stronger the rigging and the tighter the wire is stretched, the greater a distance may be left between posts.

No dimensions are given for the trolley posts and arms, because this point is immaterial. These details should be constructed strongly enough to support the weight they are to carry, but if your track is permanent you will probably want to install heavier equipment than if you erect your set in the dining room and have to take it down before dinner. On this page you will note how to construct the curved part of your track. The one given here is about as tight a curve as the car will be able to negotiate without derailing. Where the track curves you will have to use galvanized iron instead of wire, as the wire cannot be strung in an even curve. Be careful of the soldering and the car won't jump the track.

Where the metal strips are used on the turns it will be necessary to place an arm at each 45° segment of the arc, this because the car rounding the track will have a tendency to spread the track out of shape unless it is adequately supported.

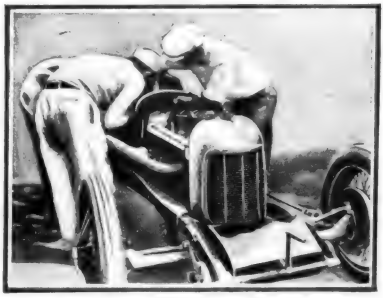
Spacers will also be necessary about every five inches on the turns. The drawing on the top of this page shows how these spacers are constructed and also shows you how to construct the arms and attach the track.

With these instructions you should have no trouble with the construction.

MOTOR MECHANICS

Edited by
RAY F. KUNS

Attempting to start the motor in cold weather usually causes the air to turn blue long before the manifold becomes hot. Let Mr. Kuns, a recognized expert in the motor industry, give you the benefit of his many years of experience in solving this vexing starting problem.



Cold Weather Starting and Some Trouble-Hunting Hints

IN ORDER to introduce and compress a fuel charge it is necessary to turn the engine over at a fair rate of speed. Heavy oil prevents the engine being turned over rapidly so give thought to the use of a lighter oil for winter. Make a test of the oil by placing a bit in a saucer and set it out overnight when the thermometer drops to low levels. If the oil will not pour you may be sure the engine is going to be hard to start.

Having the engine where it is possible to turn it over at a good rate of speed even when cold, the next point to keep in mind is the quality of the gasoline. Raw gasoline may not be mixed with air to form a fuel mixture. It must first be vaporized, and some gasolines are more volatile than others.

Heat is a great factor in vaporizing fuel. Queer as it may seem most car owners have the idea that if their engine is equipped with a device for heating the intake air that this will help in starting the engine even when the engine is cold. This is quite erroneous. The hot spot or heating device cannot come into use or perform a useful service until the engine is developing heat.

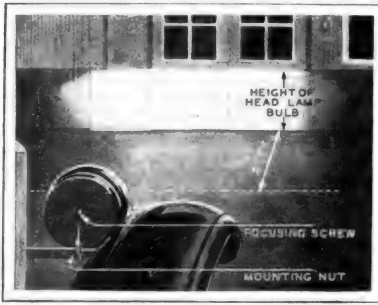
Unless some such device as an electric vaporizer, "fuelizer" or "fumer" is used as a source of initial heat then some other means of vaporizing must be depended upon to get a start. The best grades of winter gasoline in combination with efficient carbureting devices will ordinarily give a start, after which the heat developed comes into play and helps to maintain a proper mixture.

Car owners generally realize that the storage battery is only 50 or 60 per cent efficient in extremely cold weather. Experiments have proven that a storage battery which will not give sufficient spark when turning over the engine to fire the fuel charge will give sufficient spark if hand cranking or towing is resorted to. The battery situation is one difficult of correction. The best that can be hoped for is to have a battery of large capacity and have it in tip top condition. Given compression, properly vaporized fuel and a good spark the engine will start.

When testing the spark of the engine, hold the wire at least three-eighths of an inch from the cylinder block and if a good fat spark jumps you may believe that the electrical system is O. K. When a test proves the ignition system is faulty, the best plan in the winter time is to go over all of the wires with a clean, dry cloth, also go over the distributor head, both inside and out and wipe away all traces of moisture, especially around the outside terminals of the distributor head.

Even with the proper attention there are some cars which are chronically hard to start. The owner, knowing this, should make provision for easier starting by choking the engine when he runs the car into the garage at night. If this does not remedy it then some form of heat should be supplied.

Directions for Focusing and Adjusting Your Headlamps



By marking the garage door you may adjust your own lamps.

EVEN when properly adjusted headlamps are more or less of a menace to approaching cars. When they are out of adjustment or out of focus, this constitutes a real menace to life and property. Owing to the fact that the headlamps are so easily pushed out of position, they may become out of adjustment without knowledge of the car owner. By focus is meant the proper position of the filament within the bulb, with reference to the parabolic reflector of the headlamp. This position is at a point which will give a steady confined beam. Having properly focused the bulb, which work may be done by means of the adjusting screw, illustrated, the next step is to install the lens. Ordinarily the lens serves to spread the beam rather than doing anything more.

The positioning or actual adjustment of the headlamps with reference to height of beam is quite essential. This work is done usually by loosening the mounting nut illustrated and focusing the entire headlamp or pointing it in the proper direction so as to bring the top of the light beam at a proper position.

If the top ray of the light beam is not permitted to come at a point higher than the center of the electric light bulb, which distance may be marked off on the garage doors, then it is not likely that the rays will come high enough to affect the approaching car driver.

A Home-Made Device for Replacing Bushings in the Frames and Axles

THE device illustrated in Fig. 1 is easily made up from parts found around the average home garage. Bushings in car frames and front axles ofttimes require renewal. The most difficult job is to remove the old bushing.

By using the device shown in Fig. 1, the new bushing, shown as B, is placed in position against the end of the old bushing, A; a bolt D is inserted through the bushings against a washer E. A short length of pipe to make another bushing, marked C, and being large enough to admit the bushing A, within it, forms the base against which the pulling is done when the nut G is tightened against the washer F. Two operations are really performed in one; the old bushing being pulled out and the new one in.

Sometimes it is quite difficult to drive out the old bushing unless a cut is made, as shown in the bushing in Fig. 2. When doing this, use a hack saw, slipping the blade through the bushing, then attaching the saw to the frame and tightening, after which the bronze bushing is sawed through, being careful not to cut into the member into which the bushing has been pressed. The saw slot allows the bushing to contract when the punch is used to drive it out. Use a square end punch nearly as large as the bushing hole, being careful not to score the other metal.

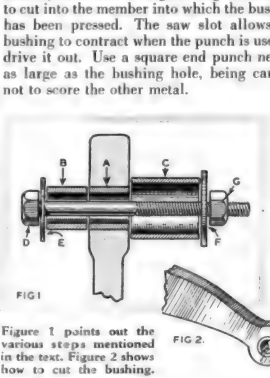


Figure 1 points out the various steps mentioned in the text. Figure 2 shows how to cut the bushing.

Durant Will Manufacture Miniature Mathis Automobiles

WILLIAM C. DURANT, far-sighted wizard of finance, who at the age of 68 can look back over a spectacular career in which he has strewn several separate fortunes in the winds, returns to the arena in December to join combat again with the giants of industry.

Mr. Durant has again taken over the presidency of the Durant Motors Corporation and his next gigantic move has become known. He has discovered—and Mr. Durant is a man who believes sufficiently in his convictions to wager $90,000,000 in the outcome—that a wide market can be created in this country for the midget car.

While nursing the idea, he beheld the rise of the Austin miniature automobile. Before the manufacturers of Austins could seize the entire field, the Durant genius for organization got to work. He wanted a car which would suit to the purpose of this new demand.

One of the midget Mathis cars which will shortly appear.

He found his answer in the product of E. E. C. Mathis, a French manufacturer of thimble-size cars. Already the Durant Motor Company, a subsidiary of the Durant Motors Corporation, is under contract to build 100,000 Mathis models.

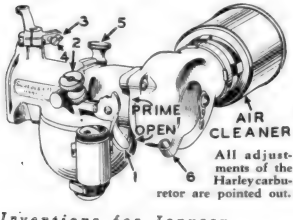
The Mathis resembles the ordinary roadster in practically all details, though its size is scaled down. It has four cylinders. Mr. Durant hopes to reap millions at $500 per or less.

Adjusting the Carburetor of the Harley-Davidson Motorcycle Engine

SOME motorcycle riders are continually playing with the adjustment of the carburetor. This is okay for the rider who understands what he is doing but may be a source of considerable trouble to the inexperienced rider.

A carburetor properly adjusted need be changed but a few notches to compensate for climatic conditions and the inexperienced would do well to make an exact count of the number of notches the adjustment is changed so that if he encounters difficulty he may return to the original adjustment.

If the carburetor is badly out of adjustment the following method will place it in adjustment.



All adjustments of the Harley carburetor are pointed out.

Turn both the low and high speed needles all the way down to a seat, that is to the right. Next back them up to the left, turning the low speed needle about two and one-half turns and the high speed needle one and one-half turns. This will enable you to start the engine, which is likely to be too rich.

Warm up the motor and then adjust for low speed, turning the low speed needle, marked 5, down one notch at a time until the mixture becomes so lean that the motor hesitates and is inclined to stop.

Back this needle up four or five notches or until the motor hits regularly with the throttle closed and the spark advanced. Now adjust the throttle lever stop screw, marked 4, to have the motor idle at a proper speed. Take the machine on the road and operate to test the high speed adjustment, running at speeds between twenty miles per hour and wide open throttle, with spark fully advanced.

Adjust the high speed needle, marked 2, downward, a little at a time until the mixture becomes so lean that the engine does not respond to throttle opening and gives evidence of back firing or spitting through the carburetor. Next open up the needle, one notch at a time, until the motor accelerates without back firing and hits at all speeds.

Build a HOUSE that

Styles in houses come and go like styles in cars. If you want a house in the latest style this forecast of what will be popular during the season 1931 may help you avoid choosing a back number.

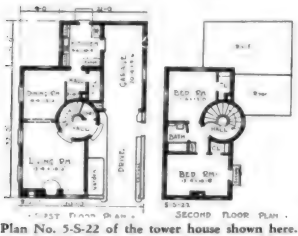
This tabloid type house with built-in garage is just as colorful and refined as an expensive mansion.

IT IS none too early for a 1931 style forecast. Even though we are now entering the winter season, spring home building is right around the corner. In many sections new house construction does not stop for Old Man Winter.

If you put your dollars into a tricky, flashy house of momentary popularity you may have a "dud" on your hands before it is paid for, and resale value next to nothing.

The wise home builder therefore puts his ear to the ground, listens to the rumble of the style parade, studies housing trends and falls into line.

A recent survey of the Chicago area, where more than 5000 new houses are built each normal year, indicates three and four room houses,



Plan No. 5-S-22 of the tower house shown here.

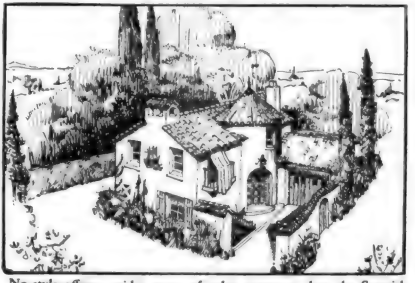
Often a kitchen or living room corner can be turned into a colorful breakfast nook. Unpainted furniture lacquered at home, a hand-made corner china cabinet, and a modernistic set of dishes will complete the picture here.

Runs Itself

by
MAURICE I. FLAGG
Director, Small Homes Bureau

HOW TO GET A BLUEPRINT AND TWO PLAN BOOKS

A one-sheet blueprint of any house appearing in Modern Mechanics magazine may be had for $1.00, postage prepaid. Two new plan books, HOMES FOR NEWLYWEDS, containing 32 of the latest ideas for low cost homes in all styles, and 16 SELECTED HOMES FOR LEAN PURSES containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn., for blueprints and plan books.



No style offers a wider range of color treatment than the Spanish and Italian. With tower houses increasing in popularity the opportunities are good for obtaining fascinating exterior color treatment.

tabloid types, most in demand by people with average incomes. More than 100 different types and kinds of houses were tested in this market. If the survey can be relied upon the tendency is toward small houses but more completely equipped with mechanical servants such as oil burners, electric refrigeration, washing machines, thermostatic heat control, humidifying systems and other devices to save time and labor. Homes that run themselves, will be a market slogan by builders and buyers from now on.

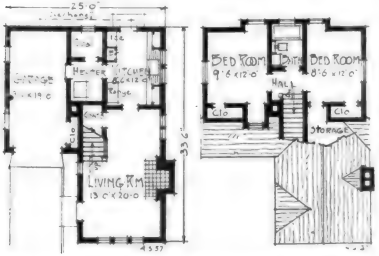
Colorful perky roofs, snubby gables, Romeo and Juliet balconies, studio living rooms, tile roofs, decorative chimneys capped with ornamental chimney pots, attached garages and still more interesting combinations of native materials, will be predominating style features.

Little houses planned like modern kitchenette apartments where two rooms often do the work of four and four rooms deliver the service of six, will be popular models if we can judge by the spirit of the times as well as the size of the average pocketbook and demands now placed upon that pocketbook.

The tabloid type houses I am speaking of can be just as colorful, just as refined, just as artistic as many a mansion that runs into thousands of dollars. The difference, however, is one of size, which means less initial cash outlay. It does not require the vision of a prophet to see that if kitchenette apartment equipment and service can be provided in small detached houses at prices the average wage earner can afford, along with mechanical servants to perform a large part of the housework and thus liberate both husband and wife from unnecessary labor, you have at least a partial answer to a demand by a large number of people.

Not only have mechanical servants done much to take the drudgery out of housekeeping and lessened the labor by housewives, but house designers have

(Continued on page 204)



Plan No. 4-S-27 of the house shown on the opposite page.

New Device Allows Bicyclist to Rest on Seat While Halted

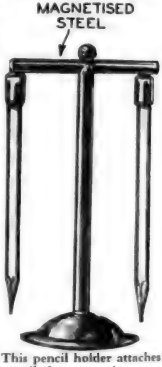
The new German invention which reduces bicycling discomfort in the midst of heavy traffic by allowing the rider to halt quickly and remain stationary. On pressing the release on the pedal the stand falls into position, allowing the rider to rest.

COMING to a dead stop in obedience to a traffic signal puts a bicyclist in an awkward position, involving much uncomfortable wobbling around. The much needed device pictured at the left, an invention of Ludwig Schwab, of Munich, Germany, enables the rider to come to a quick stop and remain standing when held up in traffic, and thus goes a long way in making bicycling in heavy traffic a safer and more pleasant pastime than heretofore.

The contrivance fits one of the pedals, and when the rider wishes to come to a stop he has merely to press a lever immediately beneath his foot. The brace on the pedal is released, a tripod effect is created, and the rider merely sits quietly till the signal changes.

A Unique Magnetic Pencil Holder

AN unfailing office pencil holder utilizing the principle of magnetism to keep the pencils fixed, and at the same time leave them removable, may be made by following the diagram at the right. The pencils are capped with iron or steel, thus rendering the eraser-end susceptible to the pull of a magnetic current.

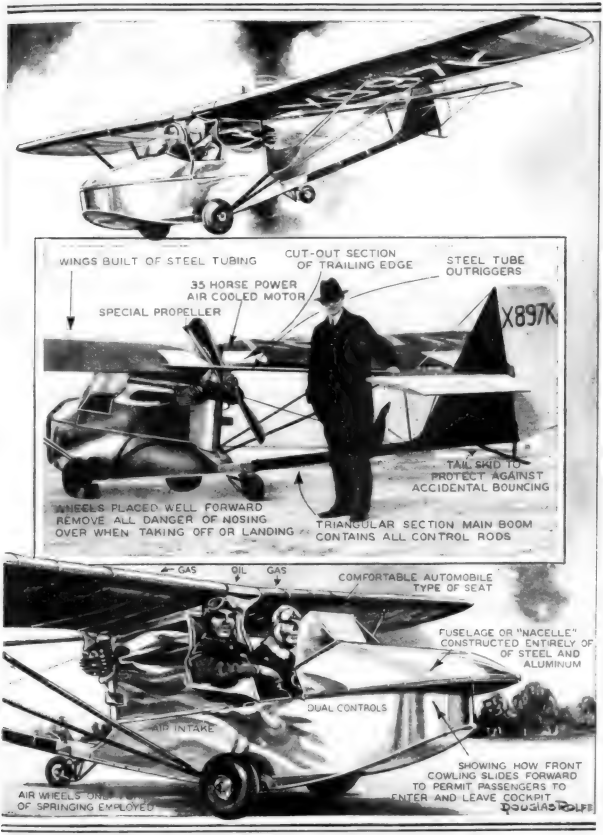


This pencil holder attaches pencils by magnetism.

The chief feature of the upright stand that holds the pencils is the cross bar of highly magnetized steel. When the end of the pencil is brought within a radius of several inches of the bar, it will attach itself there and remain hanging until pulled away. The metal caps can be made removable, so that any pencil can be inserted.

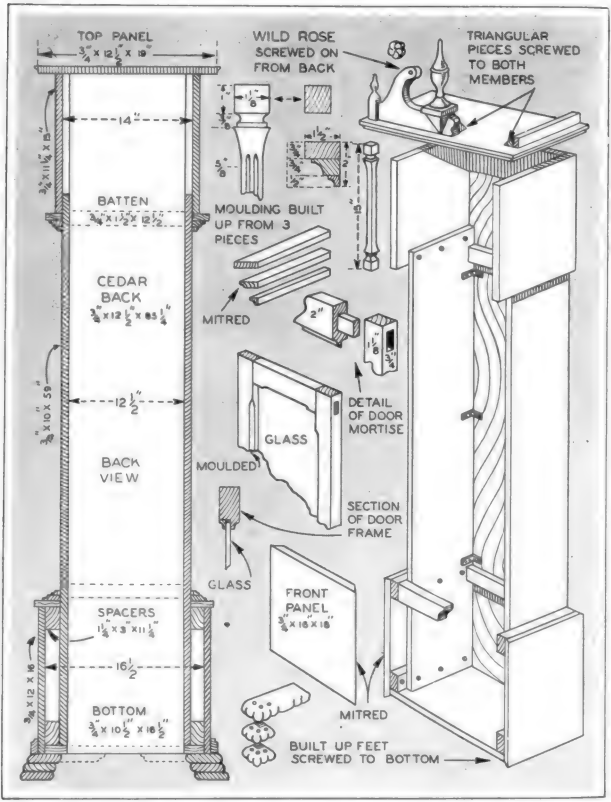
The chief advantage of such a desk holder is that there are no clips or hooks or sockets to fumble with; merely bring the pencil close to its "hangar" and magnetism takes care of the rest.

New Light Plane Has Unique Design



Designed by Prof. John Akerman of the Aeronautical Engineering Department of the University of Minnesota, shown in center above, a two-place light airplane recently passed flight tests in Minneapolis. Novel points of construction are shown in the drawing. Pilot and passenger can sit side by side.

A Grandfather's Clock for



The finished appearance of this grandfather's clock, shown in perspective and in detail above, depends upon the neatness with which the parts are fitted and glued together. Note that all the screws are driven in from the inside. The ornamental parts can be carved with a chisel and gouge.

the Amateur Craftsman

by **HI SIBLEY**

To possess a picturesque grandfather's clock you need not have acquired it as an heirloom. This article tells you how to construct a clock that will have all the charm and flavor of antiquity of an original timepiece built long ago.

WHEN a fine old grandfather's clock was lost to the family in the process of moving from New England to California, Judson P. Small, of Pasadena, determined to have another one to hand down to posterity, and to add a personal touch by building it himself. The result of his efforts is shown here—a splendid mark for other home craftsmen to shoot at.

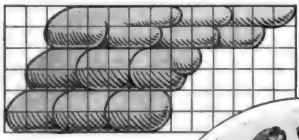
By way of encouragement to amateurs, it might be stated that Mr. Small started this job with virtually no cabinet-making experience behind him, and with only such knowledge of ordinary carpenter's tools as one acquires in minor jobs about the house. He had the advantage, however, of the use of a public school woodworking shop which was open to parents in the evenings. Obviously this handsome clock demanded in its making such equipment as planer, bandsaw, shaper, etc. Anyone who has access to similar equipment can easily duplicate the original built by Mr. Small.

With the exception of back and bottom boards, spacers and battens, this entire case was made from a single rough plank of Tabasco mahogany, 1¾ in. by 13 in. by 10 ft., which was cut into ¾ in. finished stock. Although finished Tabasco mahogany runs about $650 per thousand feet, the actual material required costs only $12. Of course, the clockwork adapted to this type of case is a considerable item, a good average installation costing about $25, and $50 more for a set of chimes.

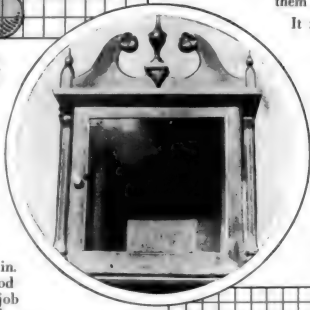
Start the job with the back board. This can be of redwood, or similar material. The finished size is ¾ in. by 12½ in. by 7 ft. 1¼ in. Set battens near the top and bottom, as shown in the perspective drawing, and install the main side boards. These are of mahogany, ¾ in. by 10 in. by 59 in., and are secured to the back board by six pairs of iron angle braces in the corners.

The finished product has an imposing appearance and makes an attractive item of furniture in any room. At the left is reproduced a side view of the clock.

The extension panels at the lower end of the case should follow. Cut and fit the panels—note that they are mitered at the front edges—and screw the spacers to them, in turn screwing this assembly to the side



The above pattern of squares makes it easy to lay out foot of clock.



boards of the main case. All screwheads, of course, are on the inside.

Two side pieces ¾ in. by 11¼ by 15 in. form the clock compartment, with a top piece ¾ in. by 12½ in. by 19 in. The ornamental wood work on top is a job for bandsaw and lathe, with two hand carved, five-petal wild roses added as shown. The pieces are secured to the top board by means of a triangular block in back, with screws in both members. This construction is illustrated in the perspective.

In hand carving—and this was Mr. Small's first experience in such work—only a chisel and gouge were used. The feet are built up of three 1 in. pieces, secured to the bottom corners with long screws, and are a very effective combination of claw and wing design.

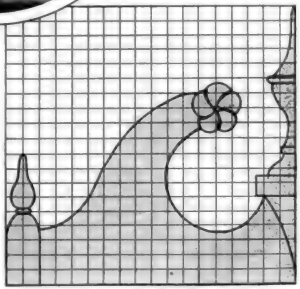
For simplicity of construction the 2 in. mouldings are built up of three sections and corners mitered. The moulding is formed with a shaper and the sections glued and nailed together.

Making the glass doors requires very careful and accurate work. The frame is ¾ in. mahogany, the side members being 1⅛ in. wide, the top 2 in. and the bottom member 2½ in. wide, rabbeted to receive the glass which is held in place by a moulding strip nailed on the inside. The cross section shows construction. Double-thickness window glass is used in both doors, the larger one costing $1.25. The corners of the frames are mortised, as shown.

All joints, of course, should be neatly fitted and glued. The appearance of the case depends largely on the care with which this work is done. Small brass hinges, one pair on each, are used on the doors, with neat spring catches to keep them closed.

It is assumed that all the material used in this case has been well finished before assembly. When the job is completed the exposed surfaces should be carefully sandpapered. Then moisten with a wet cloth to raise the grain and sandpaper thoroughly again.

When smoothed to your satisfaction give the entire job one coat of walnut oil stain. A little red mixed in gives an antique mahogany tone. When the stain is dry apply one coat of clear shellac and after that in turn is dry, rub down thoroughly with steel wool. Twenty-four hours later apply a second coat of shellac. Let this stand forty-eight hours, then rub it gently with steel wool and give it one application of furniture wax.



The ornamental woodwork is laid out according to the above pattern and cut out with bandsaw. Photo in circle above shows completed design.

This completed design makes an exceedingly attractive clock.

Modern German Tenement Colony Laid Out in Circle Form

The above photo, taken from an airplane, shows the new tenement colony built at Leipzig, Germany, and known as the "Round City," due to the fact the buildings and streets are laid out in a circle.

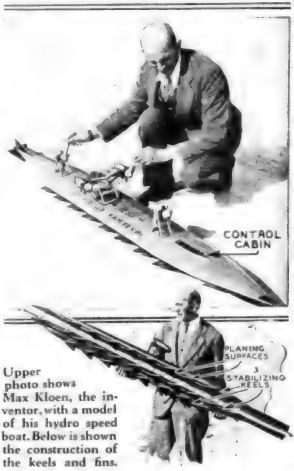
SINCE the World war a large proportion of the rural population of eastern Europe has been flocking to the large industrial centers, with the result that these cities have been experiencing a noticeable housing shortage.

To relieve this shortage many new tenement colonies have been erected. Among the most interesting of these is the "Round City" colony on the outskirts of Leipzig, Germany, so called because the streets and large apartment buildings are laid out in a giant circle.

Across the Atlantic in Thirty Hours—Via This Novel Hydro Speed Liner

MAX KLOEN, of Glen Cove, New York, has recently demonstrated his model of a proposed 750-foot hydro speed boat which embodies the principles of both air and seacraft. The revolutionary features of this strange craft include three stabilizing keels running the length of the boat upon which are mounted triangular planing fins which work on the same principle as the steps on the present high-speed motor boats.

Attached for the purpose of keeping the boat on an even keel while riding the waves, the two hollows formed by the keels permit the water to rush by with little or no resistance, thus increasing the speed. The boat is powered with four Diesel engines situated on top of the craft, aero propellers supplying the motive power. The boat will be steered with both air and water rudders. It is estimated the boat could cross the Atlantic in 30 hours.

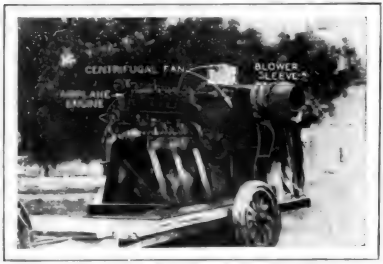


Upper photo shows Max Kloen, the inventor, with a model of his hydro speed boat. Below is shown the construction of the keels and fins.

Wills May Be Made in Talkies

IN THE future wills may be made in talking pictures, it was stated by an eminent electrical authority. Instead of writing the will in the ordinary manner, the testator will call in a motion picture operator and speak his will before the camera, the record to be preserved until after his death.

Huge Home-Made Fruit Blower Eliminates "Jacket Rot"



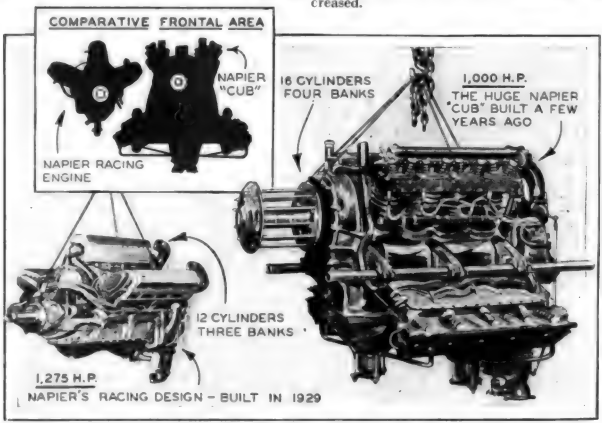
The rotting calyxes are blown from the trees with an air blast generated by an airplane motor. The fan delivers 20,000 cubic feet per minute through the canvas sleeve.

BY USE of an airplane engine, hitched to a large blower, Harry W. Owen, a fruit grower of Hayward, California, has devised a method of blowing the rotting calyxes from setting fruit, thus eliminating the cause of "jacket rot," which in previous years has resulted in heavy crop losses to fruit growers.

The airplane engine is attached to a large steel fanwheel operating inside a steel shaft. Connected to the shaft is a canvas sleeve. The motor and fan deliver through the sleeve a blast of air of a volume of 20,000 cubic feet per minute at a rate of 130 miles an hour.

Five Years' Advance in Aero Motors Shows Why Records Are Broken

THOSE who marvel at the repeated breaking of speed records will better understand how such achievements are possible if they will compare the engines and planes of today with those of even four or five years ago. These scale drawings reveal the remarkable advance made in the Napier racing engine over a five-year period. The weight and frontal area have been cut in half, while the horsepower has been materially increased.



The remarkable reduction in weight, size and frontal area of the Napier engine over a five year period is shown in these drawings. The engine at the left powered the Schneider Cup winner.

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of a thousand thrills!

MOTORCYCLING is the sport of sports — just brimming over with the freedom, the zip, the thrills that the red-blooded he-man wants.

No cooped-in motoring for him — he wants the independence, the mastery of roads and traffic, that only the motorcycle can give him. He wants the wind in his face, and the blood zipping through his veins, and the thrill of speed tickling his spine!

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Risk Their Lives For a Livelihood

(Continued from page 49)

lyzed you. A psychologist would call this a fear complex, or something like that. Daredevils don't have them.

Then there are the building-wreckers. Some of those unsung heroes ought to get Congressional Medals twice a year. It's nothing strange to hear of an entire building collapsing. Also, a dozen men may be working with their bars high up on a wall when suddenly everything vanishes from under them. A full blooded building-wrecker has got as much chance of getting an endowed insurance policy as a parachute-jumper in the mountains.

Aviation offers a number of candidates for the most dangerous occupations in the world. Take pilots like Dick Grace, who cracks up on purpose just to provide a thrill for the movies; Capt. Frank Hawks who commutes regularly from coast to coast; Al Williams, Jimmy Doolittle, Commander Richard Byrd and the rest of the daring aviator-explorers who brave the perils of the Antarctic or the jungles.

And what about those reckless stunt men who climb out onto the wings in mid-air, stand on their hands, or hang from the edge of the plane and swing themselves around like a chef flips a pan-cake? You've got to admit that's a hair-raising occupation if ever there was one.

John Weld, who in his days of airplane stunting has been everywhere on a plane while in flight except in the fuselage, has this to say about his job when he doubles for movie actors. "You don't get much glory or much money either doubling for the movie stars in dangerous stunts, but at least it's not monotonous."

Brooklyn Bridge has been quite an experimental station for the dangerous job fiends. Steve Brody's famous dive will never be forgotten. Twice a year painters give it a coat of paint. You can put that down as a nerve-wracking job. One slip and you shake hands with Brody's ghost.

Brooklyn Bridge calls up a strange twist of irony. Patrick Gerrity was the first man to cross it on the first strand of cable while the bridge was in the course of construction. As a steeple-jack he was without equal for his daring, and in those days a steeple-jack struck awe into the hearts of the most hard-

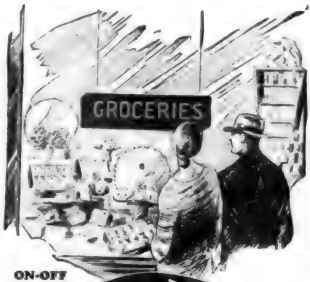
(Continued on page 174)

New FLASHER SIGN

Pays Men Up To $30 a Day

Newly Discovered Process Gives Merchants This Famous Sign at One Tenth Price of Others

Everyone has seen them, the sign of such piercing brilliance that ordinary electric signs are dull in comparison. Every merchant has wanted to have such a sign but the price has been prohibitive. *Now a miraculous new process duplicates effect of the expensive signs at one-tenth the cost!* Now, for very little more than the cost of an ordinary show-card, stores, restaurants, banks, theatres, barber shops, etc., can attract customers with this famous sign. It not only has unparalleled brilliance but a new added feature makes it F-L-A-S-H—on—off—on—off! No long, hard, messy job to install. The whole unit is completely inclosed in beautiful mahogany finish metal box. Simply plug into electric light socket.



ON-OFF
ON-OFF

No "Selling Talk" necessary—
2 Minute Demonstration Makes Sales

No "selling talk" to memorize—no experience in selling is necessary. A two-minute demonstration gives the whole story and makes 3 orders out of five calls. Walk into a store; set the sign on a show case or in the window; plug into an electric light socket. In half a moment the sign is flashing its message with a brilliance that fairly screams for attention. Show him how the message can be changed quick as a flash.—YOUR SALE IS MADE RIGHT THERE! That's why $30 a day can be made so easily! That's how Tettens of Iowa earned at the rate of $10 an hour his first day, and how others are making such big money.

Looks Like $100.00 Sells for Only $7.50
YOUR PROFIT $2.50
PLUS LIBERAL CASH BONUS PAID WEEKLY

QUICK! GET SIGN WE LOAN YOU

Merchants in your locality want this sign. Within the next 30 days they will be ordering these signs from some lucky man. Be the one to get from $2.50 up on every order. You risk no money to get started—we loan you complete sign to use in demonstrating. Just take the orders. We deliver and collect. Rush the coupon; get the generous free offer; get money immediately.

MAIL Coupon

Williams Name Plate Sign Co.
30 No. La Salle St., Dept. 6-A, Chicago, Ill.

Rush me details of your free offer and loan of full size, working sample WIL-O-LITE sign without risk to me.

Name .....

Address ..... City ..... State .....

Risk Their Lives For a Livelihood

(Continued from page 172)

boiled. For many years Pat Gerrity cut the deck with Death. On his 80th birthday he was killed by an automobile while riding a bicycle on a country road.

While on the subject of Brooklyn, one cannot think of men whose callings are hazardous without a thought for Sidney Franklin, who gave up the dry goods business for balmy Spain where he became internationally famous as a toreador. Next to lion-tamers who actually stick their own heads into a lion's jaw to examine his tonsils, plaguing a bull is probably the nearest approach to suicide.

After many heroic exploits, Toreador Franklin returned to his native heath in Brooklyn to recuperate from a little mishap which he suffered from an improvident encounter with a bull. It seems that a bull caught him on his horns during a fight last spring. He was injured badly, but true to the code of the bull-fighters he never told anyone, not even his own mother, how badly he was hurt.

Though Franklin is only 27 he gave Madrid and its royal denizens enough thrills to talk over their claret for a lifetime. A very precarious method of earning one's living, and one's death, but the Yankee toreador is going back as soon as he gets mended.

He says: "A good toreador gets a purse of $3,000 and more for a fight. And if he's a good fighter he can get all the engagements he wants. I have conquered fifty bulls."

Madison Square Garden is a paradise for daredevils. They show up here with the circus. A man gets himself shot through the mouth of a big cannon. Trapeze performers kiss the lips of Death from their high berths. That goes for the aerialists too.

Later on comes the Rodeo. Cowboys battle with steers. The bronco-busters do their darndest to thrill a jaded multitude, seeking thrills at the expense of blood that might be spilled. Prize-fighting sometimes gets into the dangerous occupation class, but since the days of bare-knuckles and John L. Sullivan it has been looked upon as a refined art.

The six-day bicycle races which they hold at the Garden together with the motor-paced races in which motorcycles set the pace for the bike riders offer plenty of talent for the super-dangerous vocations.

(Continued on page 176)

Half a Million People

have learned music this easy way

You, too, Can Learn to Play Your Favorite Instrument Without a Teacher

Easy as A-B-C

YES, over half a million delighted men and women all over the world have learned music this quick, easy way.

Half a million—what a gigantic orchestra they would make! Some are playing on the stage, others in orchestras, and many thousands are daily enjoying the pleasure and popularity of being able to play some instrument.

Surely this is convincing proof of the success of the *new, modern method* perfected by the U. S. School of Music! And what these people have done, YOU, too, can do!

Many of this half million didn't know one note from another—others had never touched an instrument—yet in half the usual time they learned to play their favorite instrument. Best of all, they found learning music *amazingly* easy. No monotonous hours of exercises—no tedious scales—no expensive teachers. This simplified method made learning music as easy as A-B-C!

It is like a fascinating game. From the very start you are playing *real* tunes, perfectly, by *note*. You simply can't go wrong, for every step, from beginning to end, is right before your eyes in print and picture. First you are *told* how to do a thing, then a picture *shows* you how, then you do it yourself and *hear* it. And almost before you know it, you are playing your favorite pieces—jazz, ballads, classics. No private teacher could make it clearer. Little theory—plenty of accomplishment. That's why students of the U. S. School of Music get ahead twice as fast—*three times as fast* as those who study old-fashioned, plodding methods.

WHAT INSTRUMENT FOR YOU?

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Harp	
Cornet	Mandolin
'Cello	Sight Singing
Guitar	Trombone
Ukulele	Piano Accordion
Saxophone	
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Don't miss any more good times! Learn now to play your favorite instrument and surprise all your friends. Change from a wallflower to the center of attraction. Music is the best thing to offer at a party—musicians are invited everywhere. Enjoy the popularity you have been missing. Get your share of the musician's pleasure and profit! Start now!

Free Booklet and Demonstration Lesson

If you are in earnest about wanting to join the crowd of entertainers and be a "big hit" at any party—if you really *do* want to play your favorite instrument, to become a performer whose services will be in demand—fill out and mail the convenient coupon asking for our Free Booklet and Free Demonstration Lesson. These explain our wonderful method fully and show you how easily and quickly you can learn to play at little expense. This booklet will also tell you all about the amazing new *Automatic Finger Control*. Instruments are supplied when needed—cash or credit. U. S. School of Music, 2621 Brunswick Bldg., New York City.

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Please send me your free book, "Music Lessons In Your Own Home," with introduction by Dr. Frank Crane, Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

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Pound little ship you ever saw, flies with the best of them all one statement. Full-fuselage construction. Machine-made Balsa-sheet and cut-board with built-up wings, formed bent propeller with rubber, steel wheels, full-head metal nail—everything ready for construction. Demountable wings; weighs 1 oz.; complete. It's a beauty and a GREAT Flier! Get yours now.

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P. J. F. BATENBURG CO.
DEPT. 226 RACINE, WISCONSIN

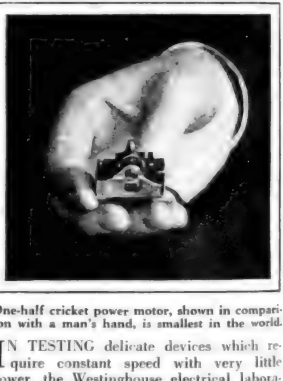
Risk Their Lives For a Livelihood

(Continued from page 174)

Further on uptown we find men at work in an excavation. It has something to do with a new subway line. You can't be sure just what the excavators are looking for because they are 600 feet down at this point. At three different times within the past year a quantity of dynamite has exploded down in that subterranean cavern, with a number of deaths resulting. Presumably some workmen carelessly tried to drill through a hole plugged with dynamite.

To speak in the popular argot, one can find the most dangerous occupations in the world right in his own backyard, any undertaker will tell you. Not all the perilous occupations of man are thrilling, nor do they excite thrills in those who watch men at certain jobs, such as the man who sits around tending a powder magazine. But what we have been giving the once-over are the jobs which any sane-minded insurance agent would regard as V.P.R., which scribbled next to your application would mean Very Poor Risk.

A One-Half Cricket Power Motor



One-half cricket power motor, shown in comparison with a man's hand, is smallest in the world.

IN TESTING delicate devices which require constant speed with very little power, the Westinghouse electrical laboratories use the smallest motor in the world—so small, in fact, that crickets instead of horses are used as a standard of power measurement

"I will give you nerves of steel and muscles like iron"

George F. Jowett

Champion of Champions

I was once a weakling. But I craved to be strong. I increased my chest from a puny 32 inches to 47 inches. I built up my weight to 200 pounds; my neck to 18½; my biceps to 18; forearms to 15½; wrists to 8½; thighs to 26; my calves to 17. What I did for myself I can do for you. I will give you muscles like mine. I will make you a two-fisted fighting man with nerves of steel and muscles like iron. I will send the good red blood surging through your veins like the onrush of electricity and I will do this in only 90 days. I will build you a new body that every man will envy and I will make you feel like a lion ready to tackle anything—ready to fearlessly conquer any feat of strength, because I will give you the "know-how," endurance and muscles so that you just can't fail.

Famous Athletes Endorse My Methods

My methods are endorsed by physicians; by Herman Gorner, strongest man in the world; Arthur Dandurand, the Canadian Sandow; Arthur Gay, winner of first prize in America's Most Perfect Man Contest; and Jim London, the famous wrestler.

Ask any of these men about my system and they will tell you there is no bunk about it. They will tell you that George F. Jowett plays the game square. I value that reputation more than all my medals—more than all my records and cups. The reason why my system never fails is very simple. My lessons build without strain. They build from the inside out. They put new life and vitality into your internal organs as well as in your biceps. I'll make you fast and enduring, as pliant as a whip, and as strong as a steel trap.

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Making Magic for Magicians

(Continued from page 65)

"Here is how I go about doping out magic," said Ducrot. "A man will come to me and say, 'I've got an act that is a little dull in a spot. I want to brighten it up with something. Maybe you could show me how to turn a goose into a monkey.'

"That magician is right. He certainly could brighten up his act if he could turn a goose into a monkey. He gives me his idea and then he leaves and says he'll be back in a week. Then I sit down and try to scheme out a way of changing a goose into a monkey. I've never tried it but I think if I got a hold of the right goose I might be able to do it. If some magician really wanted to, I'd have to furnish it to him. The tools with which I would work would be a knowledge of science, mechanics and human nature.

"You would be surprised to know that the whole world is excited over magic. Just the other day I gave a demonstration at a garden party given by Gifford Pinchot, the former governor of Pennsylvania. Wallace Reid and Rudolph Valentino never failed to drop in here when they were in town. Jesse Lasky, the motion picture magnate, is quite a bug on magic.

"Women also go for magic in a big way. Take the former Alice Roosevelt, now Mrs. Longworth. She is very fond of card tricks and from time to time I have gone to Washington to impart to her some of my sleight-of-hand work with cards. I don't mean to insinuate she cheats at cards, you understand. I simply say she sometimes entertains her intimate friends with a couple of choice passes at cards.

"Then there is Mrs. Beatrice Houdini, the widow of the most famous magician who ever lived. She joined one of my classes for magicians. It didn't take her long to acquire a fancy repertoire and I put her in vaudeville where she went over with a bang.

"One of the most extraordinary cases of a man remote from the stage world applying magic movements to his profession is the Rev. Dr. C. H. Woolston, of Philadelphia. The Quaker City minister employs tricks of magic in his Bible classes to illustrate stories from the Scriptures. Dr. Woolston and I have spent many hours together studying out these experiments. I have attended his Bible study classes and have noted how these demonstra-

(Continued on page 180)

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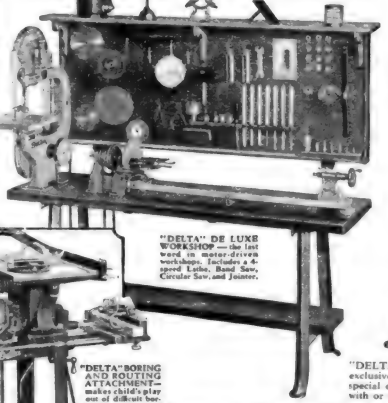

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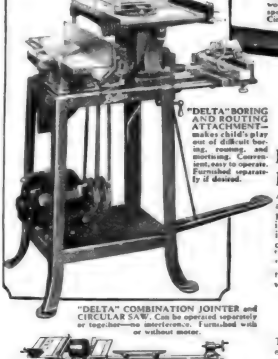

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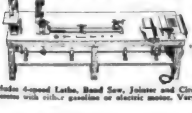

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Making Magic for Magicians

(Continued from page 178)

tions have impressed the students, apparently indelibly.

"I have sat in the rear of the room and watched Dr. Woolston explain to the Bible students how Jesus Christ changed water to wine, and he illustrated it with a trick of magic which is quite a common phenomenon in the magician's line. I have seen him illustrate the multiplication of loaves of bread in the same way. We even went farther. We succeeded in demonstrating the story of the Creation—bringing the earth and water, then light and sun, and the moon and man. I think Dr. Woolston's idea has been marvelous and his work has been most successful.

"Yet magic has been applied to more prosaic uses. In recent months it has become very popular with salesmen, although they have resorted to it on a more or less smaller scale from time immemorial.

"Scores of salesmen trot in here every day to inquire about some little article by which they might win their way into the good graces of a prospect. They say it helps business along. For instance, for the golf ball salesman I have a trick array of golf balls by which he can produce five balls from one which he has at first.

"For the purveyor of cigars I have the trick cigar. He offers it to you and as you reach for it, it vanishes—up his sleeve. Just a little laugh to start you off on, then commences the process of putting his product over. A lot of these gents come over from the garment district. They are always looking for tricks to do with pieces of cloth material. They get it too, all the way from trick handkerchiefs to stockings which can be changed into shirtwaists, which ought to be a good article to sell in any market. But this is magic I'm talking about—and apt to be deceiving.

"A man in this business, and I doubt if there are five in the same trade throughout the entire country, has got to keep abreast of the times. I have to follow the day's events, the styles and fashions. No day slips by but what I don't turn out something new. Many times I notice a list of the world's toughest jobs but no one ever thinks of me. What about these magicians who stroll in here and proposition me to do the impossible?"

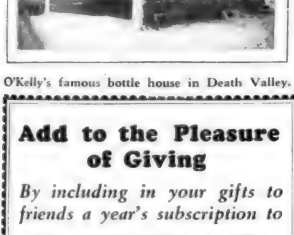
Next Professor Ducrot brought forth two

(Continued on page 182)

Death Valley Has Bottle House

THIS glass house apparently will remain as a lasting monument to the gold boom days in Death Valley, California. Already it has withstood the elements a good many years and it is as securely intact today as when it was finished.

The story told of it is that a prospector named O'Kelly built it from bottles because he did not have the money to buy lumber or concrete. Bottles being plentiful, he conceived the idea of using them instead.



O'Kelly's famous bottle house in Death Valley.

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"'We certainly owe a lot to the International Correspondence Schools. You would never have received this increase if you hadn't studied at home and prepared yourself for bigger work.'"

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Making Magic for Magicians

(Continued from page 180)

small wooden cubes, painted on all sides in various colors. Placed between the thumb and index finger, he twisted them so that the colors shifted without detection. Last year over 100,000 of those cubes went out of his magic shop at ten cents a pair, plus a little slip of paper which gave the directions.

"Just a little simple trick," said Monsieur Ducrot, "but you'd laugh at yourself for being so foolish when you found out how it's done. Recently Charles Edison, the son of Thomas A. Edison, called me to his hospital bedside. He said he wanted to see me do the kaleidoscopic blocks trick, which is the one I have just described.

"You know that just fascinated him. It lifted him up in spirit. He was weary of lying in a hospital bed. He wanted some sort of entertainment to distract him. I figured if that magic was going to work any kind of a cure, he was going to get a substantial dose of it. So much to his surprise I produced the two silver bowls and showed him how rice could multiply, and then vanish, leaving me only water to pour out. I know after I get through talking about this there are going to be a lot of people around the country who will holler that it's a fake and all that sort of thing.

"But all I say is that I'm located at 304 West 34th St., New York City, and that they are invited to bring any two bowls and their own rice. And I'll send them away with a bowl of water. But one thing I would advise my guests to do is to take a final peek at the package supposed to contain the bowls they depart with—there's no telling about our legerdemain tactics. They may leave with only a handful of rice in their bundle. For instance, Mr. Magazine Man, if you want the fountain pen you came in here with, you will find it in that tall silk hat down at the end of the counter."

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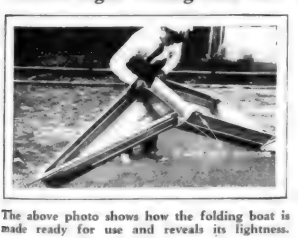
TRACKLESS trolley service was inaugurated in Detroit recently when the new noiseless, smokeless and electrically operated cars were put in service. The cars, which can seat 40 passengers, can accelerate to a speed of 35 miles an hour in thirty seconds. They may be swung sixteen feet on either side of the double overhead trolley wires which supply the power, allowing them to take on passengers at the curb.

Featherweight Folding Steel Boat



The above photo shows how the folding boat is made ready for use and reveals its lightness.

AT a recent exhibition of aquatic sports in Germany, a portable steel boat attracted considerable attention. The boat, which is shown above, is so light that it may easily be carried under the arm. It folds in the middle for carrying, but when extended and locked with spring clamps is said to be as rigid as a one-piece craft. It may be used with an outboard motor.

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It is a simple matter to install the GOLD TEST AERIAL—even a child can do it in a minute's time. It can be placed anywhere, inside or on the back of the radio cabinet. It does away with all lightning hazards and because it does not connect into a light socket, all AC hum and line noise is eliminated. Once installed, no further attention is required. It is not especially recommended for battery sets, but is fully efficient at all times on all other sets.

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- ( ) R.F.D. Carrier
- ( ) Meat Inspector
- ( ) Special Agent
- ( ) Customs Insp.
- ( ) Steno-Typist
- ( ) Immigrant Insp.
- ( ) City Mail Carrier
- ( ) Border Patrol
- ( ) Typist
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Instruction Bureau, 233, St. Louis, Mo.
Send me particulars about positions marked "X"; salaries, locations, opportunities, "How to Qualify", etc.

Name

Address

Toys Keep Pace With Children

(Continued from page 56)

One maker of electric trains spent $25,000 during the year to perfect a train with trucks and stations. It included the last word in mechanical make-up. These sets were sold for $100 each.

Toy gliders were produced in abundance. Magic goods came in for a generous share of the country's fun market. Boats went over big because of the attempt of Sir Thomas Lipton to wrest the cup from the American defenders, as well as the popularity of speed races.

Last July several hundred American toy manufacturers had their annual convention at White Sulphur Springs, West Virginia. It is interesting to note what kind of sport these concocters of the nation's play implements went in for during their idle moments. It may be surprising to learn that ping-pong and lawn-bowling proved their favorite pastimes.

And before Santa Claus and Uncle Sam have their last pinch of snuff together until another year passes, Santa will tell your Uncle Samuel that toy exports to other countries during the past year have exceeded $5,000,000. He will confide to him that Germany, which was once the chief source of Saint Nick's supply, was one of America's best customers.

Woman Invents Fool-Proof Plane

MRS. T. NAVARRO, of London, England, has recently perfected an airplane design which she claims is practically fool-proof. Among the many safety features is a rudder air-brake which is said to reduce the landing speed materially, enabling a plane to approach the field at a steep glide and level off for the landing with a very short run. She is shown below with a working model.

Mrs. Navarro examining the air-brake rudder.

The Goliath of Aerial Cameras

Camera is electrically heated at high altitudes.

THE Air Corps of the United States Army has developed an aerial camera without a counterpart in magnitude. Labeled with the unpretentious letters and numerals "K-7A," it weighs 130 pounds. The roll of film which it accommodates is 150 feet long.

As formidable as these details are, the world's giant camera functions with human-like ingenuity—completely automatic in operation. Moreover, it not only functions without human assistance but it has an auxiliary instrument which records the elevation of the airplane containing the camera, the time, date and number of negative.

Page's Work a Day Long Joy Ride

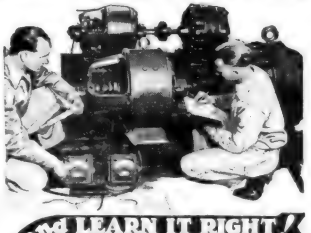
THERE is a page at Cannes, famous French resort, who doesn't mind how far he has to travel to deliver messages. And the reason is perfectly obvious for he has a sleek, sporty little car to run around in to do his work.

The car is patterned along the lines of a racer but instead of the usual power plant it has an electric motor. The midget car has a speed of 25 miles an hour and saves the management much time.

Lawn Mower a Good Shop Truck

A LAWN-MOWER makes a good simple shop truck. Take out gears, cutter and wooden roller but leave stationary blade to act as rest. A wire hook can be attached to the handle to hold boxes, barrels and bulky loads.

Learn Electricity
IN LOS ANGELES



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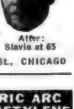

After: Slavin at 65

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Learn How to Fly a Glider

(Continued from page 124)

glider student can go up five or ten feet and gradually become accustomed to longer flights. During this part of the training the rope is not released, which saves time and speeds up instruction, as no time is wasted pulling the free end back to the glider.

Above fifteen or twenty feet there is some danger in remaining on the rope, so it is better to pull the release and make a free landing. So long as you are on the rope the glider is carrying the weight of the manila, and when it is released the glider nose has a tendency to bounce upward. To offset that the glider should always be nosed down into a glide just before you pull the release. A glider should never be flown as a free ship without having the nose down for gliding. You must keep your forward speed, and that can only be done by keeping the nose below the level.

In early flying it is better to nose down sharply and make a rather steep dive back to the ground, pulling the stick back gradually so the dive smooths out into a curve, until you are level just a foot or so off the ground, and with plenty of speed to hold the ship there. To make a perfect landing then you only need to hold the ship off until she loses flying speed and starts to settle, then ease the stick back and drop onto the skid. It takes practice, and you may bounce a few times until you get the feel of the exact landing speed, but with a drop of a foot or so you can't do any damage to a well-built glider, or yourself. Pancake landings are bad form, but not serious from such low altitudes.

Next month's article will tell about higher flights, banked turns, figure "S"s", 180 and 360 degree turns, and secondary gliders and sail planes.

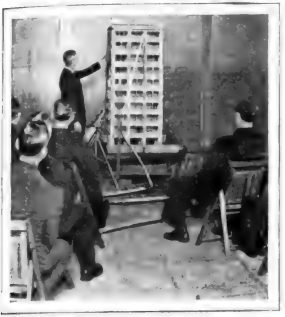
(Continued next month)

Bathing Compulsory in Poland

INHABITANTS of Poland will take regular baths whether they like it or not. It has been found that most of the Polish homes contain no bathing facilities, and that persons living thus are likely to take no baths at all during the winter months. The government, therefore, will issue to each inhabitant a ticket calling for twelve baths during each three month period and magistrates will see that all tickets are used during the prescribed time.

Thank You for Mentioning Modern Mechanics and Inventions for January When Writing to Advertisers

Fire Fighting Taught in College

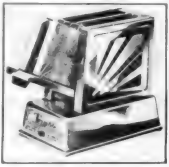


Model of ten-story building with stream from small water line, showing that streams directed from street are not effective above certain floors.

VISUAL instruction by many modern methods is proving highly effective in the Fire College at Los Angeles, Calif. The firemen are required to attend certain classes, where they witness demonstrations with various models and pieces of fire-fighting apparatus. A study of fire hydrants, for example, is made. Cross sections are displayed, showing their contruction. A knowledge of the flow of water through hydrants and water mains is as essential as a knowledge of hose. The proper method of fighting fires on various floors and in buildings of different construction is demonstrated by means of models.

Household Toaster Ejects Toast

SMALL household toasters are now equipped with timing devices which permit the housewife to forget the toast while she prepares the rest of the breakfast. When the toast is done to a nice turn the wire holder, which also forms part of the door, swings open automatically.



This toaster automatically ejects toast when finished.

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Here's the new **White Wasp**, made especially for us by Kingsbury — world's leading maker of model planes. Rises off ground—will not nose-dive, stall or spin. Positively slickest plane you ever saw. Will outperform most planes costing several times as much. Several brand new features which insure supreme performance. Not a construction set—a ready-to-fly plane. 20 seconds after postman delivers your plane you can send it into air, banking, zooming, rising over buildings.

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Rain-Making Machine Is Sought

(Continued from page 89)

with electrically charged sand and at the same time they attempted to precipitate rain from massed vapor.

These two men obtained the co-operation of the Army Air Service and they carried on their experiments from airplanes over McCook Field, near Dayton, Ohio. They were hailed as pioneers and the end was envisioned of the London fog, as well as the fogs which endangered shipping on seaports of America and Europe.

It was their plan to fly 400 to 500 feet over the clouds. The plane would discharge the electrified sand above the tops of the clouds, enlarging the drops, coalescing them or causing uncharged drops to evaporate, thereby compelling the larger drops to descend in rainfall. Mr. Warren maintained at the time that they actually dispelled clouds in ten minutes. However, in cases of drought where there were no clouds, the problem might be beyond their reach or control, they said.

A special apparatus had been attached to the airplane which could discharge 30,000 to 40,000 volts. The plane carried eighty pounds of sand of 150 mesh. It had a wind-driven generator and electric equipment capable of discharging sand charged either positively or negatively, according to the will of the operator. The plane went at 100 miles an hour over the specific cloud region. Little of rain-making value developed out of these experiments.

Still later, aviators tried to break a drought in Hongkong, China, by dropping powdered kaolin in the clouds, thereby hoping to precipitate rain. But their efforts were futile.

During the latter part of the last century it was generally believed that fires might bring down rain. James Espy, a meteorologist of Pennsylvania, was the greatest exponent of this theory. But this idea also went up in thin air.

Other notions were that explosions and concussions could produce showers. But the World war, with all the heavy artillery explosions, and a couple of volcano eruptions have discredited the concussion theory for making rain-drops.

Back in 1891, a Chicagoan named Gathman shot a stream of carbolic acid 600 feet into the air. He maintained that clouds formed as a result and rain was subsequently

(Continued on page 191)

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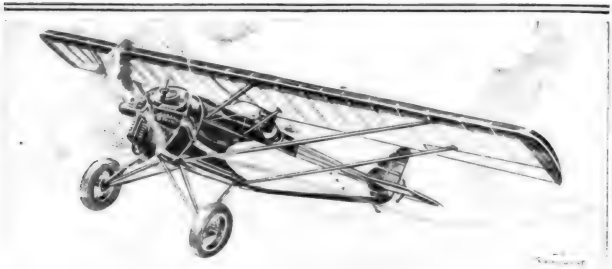

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A remarkable secondary glider which will prove invaluable in teaching you how to fly. Everything presented in simple, straightforward fashion which makes it easily understandable—no difficulty in following instructions.

Look for This Cover:

Rain-Making Machine Is Sought

(Continued from page 188)

produced. But then again, there is no positive record of his accomplishment. Besides, carbolic acid offers no allurements in this field for practical purposes.

In 1893, a Frenchman named Baudouin, was supposed to have caused rain by establishing an electrical contact with clouds through the medium of a kite. He said it worked twice in Algeria. By removing the kite he stopped the rain, he said. But that was so long ago no one remembers whether it did rain in Algeria on that particular day.

But getting down to a constructive viewpoint, C. F. Marvin, chief of the United States Weather Bureau, has manifested a deep interest in all attempts to make rain. There is no disputing the fact that a successful machine would be priceless, that its inventor would go down not only as one of mankind's greatest benefactors but also one of the most celebrated engineers.

So intrigued was the weather bureau at Washington that two officials were on hand during Dr. Sykes' demonstration at Belmont Park. The field is open, they said. One of them expressed the opinion that many a cellar may harbor the discarded apparatus which might have served the purpose if only brought out into the open and developed. There is no limit to the possibilities of an apparatus which can do away with drought and the rain-check.

Scientist Studies Hatless Vogue

AS a means of finding out whether or not people ought to wear hats for health's sake, Prof. A. Stindler, of Berlin, is testing the temperatures of the insides of hats with thermometers.

It is often stated, for example, that hats keep the scalp and hair too hot, thus interfering with the circulation of the blood and causing baldness and other troubles. Studies are to be made of the differences in temperature inside different kinds of hats under different weather conditions, such as air temperature, sunlight and humidity.

In one experiment it was found that the temperature inside a panama hat was only 77 degrees, while the temperature outside was 91 degrees. These differences in temperature, however, differ with kind of hats worn.

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Trapper's Trail Brings Profits

(Continued from page 117)

mound is made, and carefully conceal the trap chain and the drag to which it is attached. Then I throw the bait thirty or forty yards away. Such a set made where the trail crosses an old log is almost sure to catch. For when the fox gets a scent he leaps onto the log to take observations, and is sure to walk right into the trap. This set is just as good for wolves as for foxes. Opossums and coons, too, are often caught this way."

Remember that preparations for this sort of a set should be made some time before the season opens, so that the material used in building the mound will have lost the "man odor" and become weather beaten.

"I use the same principle in catching mink," explained the old timer, whose catches of this paying fur have been very large. "When a mink catches the scent of fresh meat, he doesn't go blundering after it, but is instantly on the guard, alert for danger. From some vantage point, too, makes an observation, and that's where I get him.

"When a mink is fishing, he works upstream. Where a log has fallen, with one end in the water and the force of the current turned, is a natural place for a mink to make a landing. With a heap of dirt at the end of this log, and a trap hidden as for the fox, I throw the bait over the other side of the log, and get the mink while he is taking his 'look-see'."

In making a mink set, however, do not use a drag on the trap, but a drowner. There are several ways of making this, the simplest and best for woods country being a pole small enough to slip through the ring on the end of the chain. Trim off limbs and branches from the pole, which should be large enough to reach well out into the stream, where it is securely anchored. The upper end is fastened in the bank of the stream just under the water, with the stumps of the branches pointing toward the lower end. When the mink is caught it instantly leaps into deep water. When he leaps the ring on the trap chain slides down the pole, becomes entangled with the mink, and drowns him. The same set has been used with success in catching muskrats. No matter what set is used, a piece of wood should be attached to the chain to float when

the animal jumps into the water. Otherwise, animal and trap will disappear.

The raccoon tries the skill of the river trapper to the utmost. Their instinct and cunning warn them away from traps. But coons may be caught in paying numbers if the trapper persists and uses skillful methods. Like the mink, the coon hunts and fishes along the bank of small streams. But it is not where they bed, but where they hunt, that traps should be set.

Place the trap under an overhanging bank, where a narrow ledge of soil permits the animal to walk. Use a No. 1½ trap, screened with a few wet leaves and fastened to a drag or drowner. Great care must be taken not to leave odors. Also, be sure to use only clean bait. The cleanly habits of the coon makes him a difficult animal to catch, but his curiosity may easily lead him into the snare.

The chief income or the average trapper is from the pelt of the much-disliked and unpopular skunk. These are the most widely distributed and plentiful animals, easily caught by experienced trappers. Skunks are not, as the amateur imagines, found in greatest numbers in wooded, unsettled districts. They stay close to human habitations, finding refuge under old buildings, roots of fallen trees and burrows in fields. During extreme cold weather he stays inside. When the weather becomes warmer, set the traps and get ready, using No. 1 or No. 1½ traps, placed near the entrance. Cover trap lightly with powdered leaves, fastening the chain to a drag. If bait is used, a couple of stones or logs may be rolled together, forming a V, with the trap between the spreading ends and the bait farther in between the logs. Fresh rabbit or muskrat meat makes best bait. The spreading ends of the V should be just far enough apart to let the skunk pass between.

When a burrow is found inhabited by skunk, there may be a half dozen animals sleeping together. Use a pick or mattock to dig out the hole. One hunter netted $20 for a morning's work last winter.

In making a land set for the fox trap, dig a hole in the ground barely large enough to contain the trap, yet deep enough for the stake and chain by which it is fastened

(Continued on page 194)

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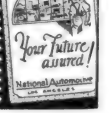

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to be concealed. Place the earth on a piece of cloth. Any not used to cover the trap should be carried away. Place the trap down securely, so that only the pan of the trap will give. Place a piece of cotton under the pan to keep it from tripping until the fox steps on it. Carefully cover the trap with soil free from pebbles or sticks, shaping the surface like the surrounding soil. To keep the trap from freezing in winter, bed it in chaff, dry leaves, twigs or needles of pine, spruce or hemlock.

Foxes are keen-scented, suspicious animals. The ground must be free from human odors. Steel traps should be cleaned by boiling them with twigs of spruce, fir, hemlock, birch, or sassafras, or by burying them in the ground. After being cleaned, the traps should be handled with gloves and kept clean until set. When trapping such wary animals as foxes and wolves, experienced men travel on horseback. Arriving at the site of the set, they drop a blanket on the ground on which to stand while making the set, and are careful not to step on the ground. After the trap has been staked and set, the trapper sprinkles some scent among the brush on either side of the trap to call the animals to the snare.

Robbins Long Distance Transmitter

(Continued from page 142)

In the second system, three 8 mfd. filter condensers are hooked across the rectifier output, which, incidentally, runs to the plate voltage supply terminals of the transmitter. Any reliable radio supply house will provide you with the parts specified above. The choke coils consist of thousands of turns of fine wire, so they had better be purchased, too.

To keep the input line voltage steady and thus insure a steady DC output, a plug-in line voltage regulator should be inserted in the line between the wall receptacle and the primary of the transformer.

If you desire to use a microphone, and thus transmit speech, you can rig up a loop modulation system as shown in Fig. 7. This consists simply of a loop of wire mounted on a bakelite strip and placed close to the grid end of the primary coil of the transmitter.

(Continued on page 196)

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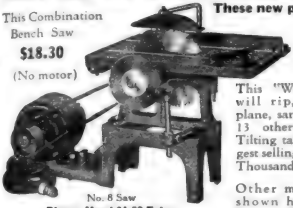

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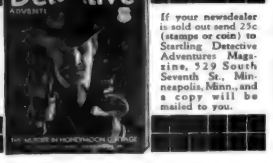

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Robbins Long Distance Transmitter

(Continued from page 194)

Now, with all the apparatus constructed, you are ready to put your station on the air, so to speak. By consulting the December issue of MODERN MECHANICS AND INVENTIONS, you will be able to get an idea as to how the accessory parts are hooked up to the main transmitter. Insert a 201A tube and a flashlight bulb in their respective sockets in the transmitter, switch on your receiver, and you are ready to begin tuning your transmitter.

The first thing to do will be to find one of the amateur bands on your receiver and tune the wavemeter to it. Let's choose the 80 meter band. This can best be found by putting the 80 meter coil in the receiver and listening for stations working. After the coil is in place, turn on the "A" battery power to the receiver. The detector tube will have to be adjusted by the rheostat, but the audio tubes take care of themselves through the fixed resistors.

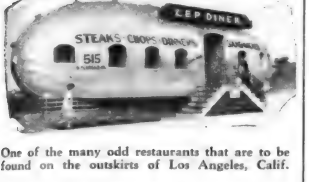
Now put on the headphones and turn up the detector rheostat until a rushing noise is distinctly heard. Then turn the tuning dial until some station is heard. The volume of the rushing sound can be controlled by the dial which controls regeneration; continue the tuning until a phone station is heard. This will indicate the upper part of the 80 meter band. Go as high as any such phones are heard talking. Remember the dial settings. Then turn the dials down until code is heard below the phones. Keep on going down until what appears to be amateur calls have disappeared. You will then know roughly the upper and lower limits of the 80 meter band.

Now with the receiver oscillating and the head set still on, you can calibrate the wave meter to the band. Find a station working at the bottom of the band and put the receiver in full oscillation. Then hold the wavemeter coil parallel to the receiver coil and two or three inches away from it.

Turn the wave meter dial slowly. When the wave of the sending station is approached the signal will stop, and then will be heard again as the wave meter dial is turned beyond it. There will be a slight click in the headphones as the wave is crossed at each side. Midway between these clicks is the wave of the station. By pulling the meter away from the receiver, this space on the meter dial can

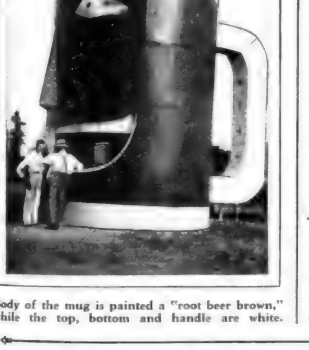
(Continued on page 198)

Highway Restaurants Built in Odd Designs



One of the many odd restaurants that are to be found on the outskirts of Los Angeles, Calif.

ROADSIDE restaurants, hot dog and soft drink stands are rapidly taking on odd and distinctive shapes to increase attention value. The success of the Graf Zeppelin no doubt was the inspiration for the Zep Diner shown on the left, while the root beer stand pictured below proclaims its wares as far as it may be seen. At night the eyes of the latter roll and blink in a lifelike manner, while the nose glows dully in a red and reminiscent manner. A lighting arrangement at the top causes the appearance of foam overflowing the rim, reminiscent of the "good old days" before the eighteenth amendment.



Body of the mug is painted a "root beer brown," while the top, bottom and handle are white.

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Have You Built an Airplane?
See Page 83.

Robbins Long Distance Transmitter

be reduced to four or five points. Mark this meter reading on the card.

Then tune the receiver to what is thought to be the top of the phone band and do the same thing. You will then have a fair idea on the wave meter where the 80 meter band operates. Do the same thing for 40 meters by inserting the 40 meter coil in the receiver and in the wavemeter. Later on, when you have learned the exact limits of each band, you can correct these readings to a finer degree.

We are now ready to get the transmitter going. Let's tune it to the 80 meter band and see what it will do. Your "A" and "B" batteries are connected and the antenna system hooked up as described.

First attach the filament tap to the primary coil at the center turn. Then turn on the rheostat until the tube is lighted by slightly over 5 volts. If you are using a milliammeter, throw the double throw switch to the front position, thus putting the meter in the "B" circuit. The little panel switch should be open. Place the right hand dial about midway and remove the antenna coil between three and four inches from the pri-

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mary. Now press the key. If the milliammeter needle rises sharply, you will know the tube is oscillating. Then close the switch so the meter is cut out of the circuit.

Next set the wavemeter dial so that it reads within the code portion of the band. Then, holding the meter coil parallel with the transmitter primary coil and two or three inches away from the plate end, press the key once more. The chances are nothing will happen. That will show that the transmitter is not oscillating within the 80 meter code band.

Still holding the meter in position, rotate the transmitter right hand dial slowly, and as the wave is approached the meter bulb will glow. Keep on turning the dial until the bulb glows at its brightest, which will show that the transmitter is oscillating on the exact wave at which the meter is set. Now set the meter at the highest and lowest points of the band and get the transmitter oscillating at those points. Make a chart of those dial settings so that you can then put the transmitter at any portion of the band instantly.

Now, with the primary coil condenser set at a satisfactory point in the band, you are ready to put the signal out on the antenna. Bring the antenna coil up to within three inches of the primary and, with the tube lighted, turn the resonance indicator bulb on by the rheostat until it just glows a dull red. Of course, the switch of the indicator must be thrown to the side that allows the bulb to light. Then press the key, and hold it down. Very slowly rotate the left hand transmitter dial, watching the resonance bulb. As the wave is approached this bulb will brighten up considerably and die down again as the wave is passed by. The proper point is just *before* highest brilliancy.

Now place the filament clip on the primary, moving it a turn at a time towards the grid end. A point will then be found where resonance is good while the milliammeter reading will be lower than when the connection is in the center. This is the most efficient point. When tuning the antenna, if the resonance lamp shows two points of brilliancy or if the milliammeter needle flips over its peak reading with a jump, it indicates that the antenna coil is too closely coupled to the primary. Pull it away until the indication is a gradual rise and fall of either indicator. About three inches is a nice safe distance from low power and about five turns from the grid end of the primary is a logical point to clip on the filament clip for efficiency.

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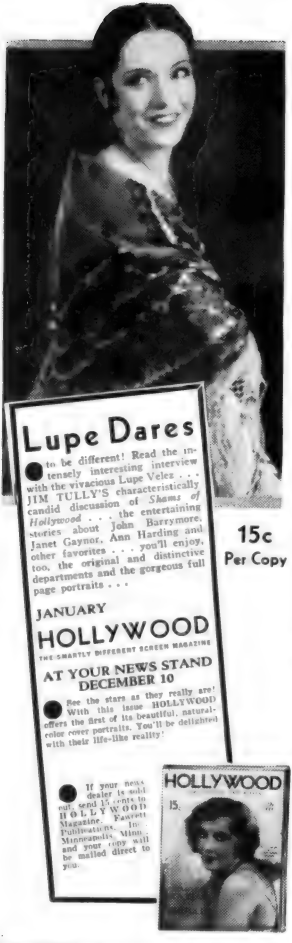

Air Liners to Europe—How Soon?

(Continued from page 72)

two things of especial interest shown. One was a ship fitted with a reversible propeller, to check the landing speed of the ship and enable it to be backed on the ground. The other was a variable wing ship, a low-wing monoplane equipped with hydraulic cylinders enabling the wings to be raised or lowered in flight, changing the dihedral, and at the same time the angle of incidence.

Of still more importance will be the development of a practical variable pitch propeller and variable chord wing. When those come the airplane will have different speeds or weight lifts and can be geared for the job just like an automobile.

The Schroeder-Wentworth plane which was built for the Guggenheim competition, but which crashed owing to a fault in construction, had both those things.

The propeller could be set for high pitch to get the load off the ground, and then changed to low pitch for high speed in flight. At the same time the chord of the wing could be changed, using a thick, weight-lifting wing to get off the ground, and gradually changing to a thinner, high speed wing in flight. Landing, the process could be reversed, using a thick cord wing to sustain the load at lower speed for an easy landing.

In effect there was a two-speed wing and a two-speed propeller, but in each case speed could be converted into weight-lifting if desired.

Wet Soil No Aid for Lightning Rods

THE familiar notion that a lightning rod should be grounded in moist earth or in a river bed was shown to be false recently by experiments carried on by an eminent scientist of the French Academy of Science. Using a generator of electric sparks powerful enough to equal lightning he found that its striking point was affected little by the wetness or dryness of the soil in which the rod was grounded. Lightning flashes, it was found, are very erratic and obey none of the laws of electrical conduction.

Ford Finds Gold in Garbage

HENRY FORD has recently completed experiments which prove that commercial quantities of ethyl and methyl alcohol, benzol, tar and gas may be economically produced from common, every day garbage. Detroit is in high hopes of marketing its entire supply of waste to the motor magnate.

Makes Insertion of Pistons Easy

Here is a piece of equipment that adds speed to repair work. It is made with a spring tension.

INSERTING pistons in automobile engines is speeded up by the use of the piston inserter shown here. It is made with a spring tension and takes care of all sizes of pistons. When using the tool, the piston with rings in place is set in the inserter and pressed into the cylinder. Is made for all models of cars and trucks.

Silk-Worm Spins Double Thread

A SINGLE silkworm will spin from the two silk glands in its head between one-third and two-thirds of a mile of fiber. Actually, two fibers are spun, one from each silk gland, and are cemented together as they emerge from these glands by a sticky material called sericin, which seems to differ chemically from the cores of the two fibers.

Hardware Horse Wears Halter

THIS novelty window display was made entirely from wares for sale by a hardware store. An oil drum is used for the body, stove-pipes for the legs and neck, a basket for the head and brushes for the ears and tail. A halter gives the novelty a domestic appearance.

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in the JANUARY

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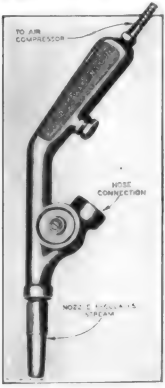
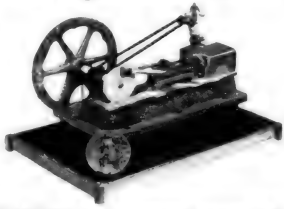


Steam Engine Made of Pipestone



RECENTLY a model steam engine, made back in 1888 by L. O. Pease, who was then 20 years old, was resurrected from a dusty attic. This unique engine, which caused quite a sensation in its day, was made entirely of pipestone, a soft, close grained stone found on the Sioux reservation in Minnesota. The only tools used were common household knives and files, and a crude lathe made from an old sewing machine. The engine is of the U valve type, with a 1¼-inch bore and a 2¼-inch stroke. Even the piston is of pipestone with stone piston rings.

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Stranger faces are in tree, clouds etc. Some are upside down, others look straight at you. **If you find 5 or more faces,** mark them with the picture and mail. If you answer now, and take an active part, **you are sure to get a special cash reward.** You may win Buick Sedan and $1,000 for promptness—or $2,500 if you prefer all cash. Mail answer today.

$1,000 Extra for Promptness

If you are prompt I'll give $1,000 extra, if you win first prize. Answer today!

Send Today Someone answering wins Buick Sedan, delivered by nearest dealer. Duplicate prizes in case of ties. No matter where you live if you want to win $2,500 first prize money, **send answer today** for details. Can you find 5 or more faces? **Send no money. Alan Grant, Mgr. 549 Washington Blvd., Dept. 233, Chicago.**

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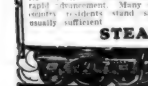

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Build a House That Runs Itself

(Continued from page 163)

learned how to make one room do the work of two and often three. Which means you can build a little house for less cash outlay and have money left for the mechanical equipment.

It looks to me like a buyers' market for some time to come. The season ahead should offer larger values than at any time during the past five years. Homes that run themselves, tabloid types, will be popular with many housewives and husbands too.

I have selected two new designs to illustrate the type and kind of houses that should be leaders in style and equipment.

Both have attached garages. In the English cottage house No. 4-S-57, the garage is so cleverly a part of the house that if doors and drive were not a telltale you would never suspect it a store house for a car. Space above the garage can be used for living or sleeping purposes. A studio living room with high ceiling, exposed rafters and raised hearth, are interior features. The house can be built with or without a basement. The present coal room can be turned into a first floor lavatory or small breakfast nook. The house is frame with stucco exterior. It can be built of common brick and painted white to give stucco effects.

The designer estimates $4500 to $5500 should build the house in or near large cities. This is a suggestive price range only.

The Tower house, No. 5-S-22, combines old world style features from Spain and sunny Italy with the practical demands of American family life. A circular stairway, a living room two steps below the entrance hall level, a fireplace with raised hearth, an arched opening between living and dining room and rounded tower walls in one end of the room, are features that would give an interior decorator heart throbs in planning fascinating and unique effects.

There's a Romeo and Juliet balcony with iron rail overlooking the drive. Roof and high enclosing walls are capped with red tile. The house can be built without a cellar.

Equip both of these little places with mechanical servants and you can close them up for a day or week and return to find them ready to use. What's more, either one of the houses offer style, color, a compact plan and it won't be necessary to stretch a modest pocketbook to the breaking point to build them.

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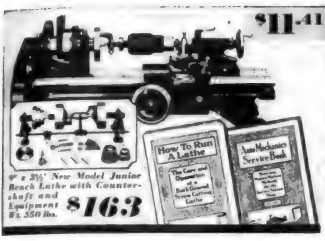

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JANUARY

Screen Play secrets

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Oregon Woman Has 2457 Spoons

Dr. Ella Kyes Dearborn and her 2457 spoons.

WHAT is believed to be the largest collection of spoons in the world is owned by Doctor Ella Kyes Dearborn, of Portland, Oregon. The collection contains 2457 spoons which completely cover the entire area of a large six-leaf cabinet, no two spoons being alike. Among the tiniest spoons in the collection are 120 made by a Chinese man that are the veriest fraction of an inch long and were made under a microscope. Her largest spoon is made of aluminum and is 23 inches long with a bowl capacity of one and one-half cups. Doctor Dearborn values her collection at over ten thousand dollars.

Copper Sulphate Aids Soldering

WHEN difficulty is encountered in soldering a copper or other connection to iron, and ordinary fluxes prove useless, a few grains of copper sulphate rubbed over the cleaned metal surface to be soldered will frequently do the trick. Rub first, then apply the usual flux and solder will adhere readily.

Passing the 1,000 Foot Mark

Here is an architect's drawing of the tallest structure in the world, which is now under construction.

HIGHER and higher soar the metropolitan skyscrapers as if aspiring to pierce the clouds and support the very heavens. The latest of these massive monoliths to rear its huge bulk on the New York skyline is the Empire State Building on Fifth Avenue at 34th Street. The claim is made for it that it is the tallest structure of any kind in the world. From the street to the roof of the 84th floor is 1043 feet, not including the observatory roof above this level or the mooring mast designed to extend 200 feet higher. There are 85 stories above 34th street and two stories below the grade. The land and building are valued at $50,000,000.

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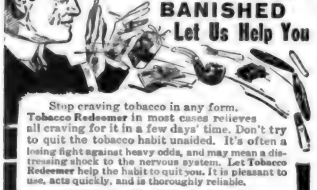

Stop craving tobacco in any form. **Tobacco Redeemer** in most cases relieves all craving for it in a few days' time. Don't try to quit the tobacco habit unaided. It's often a losing fight against heavy odds, and may mean a distressing shock to the nervous system. Let **Tobacco Redeemer** help the habit to quit you. It is pleasant to use, acts quickly, and is thoroughly reliable.

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Electric Eye Picks Phoney Gems Faster Than Expert Jewelers

Bogus diamonds turn brown under cathode ray.

THE cathode ray, or "electric eye," has been put to another use by General Electric engineers. This time it has been placed at the service of handlers of large numbers of jewels, enabling the real gems to be separated from the false in a few seconds.

Under this ray artificial diamonds turn a decided brown, while the real jewels retain their original color. When turned on a tray of sapphires in a dark room it is found that the synthetic stones sparkle while the real ones cannot be seen.

The cathode ray tube resembles the X-ray tube in appearance. The electrons expelled from the end appear as a ball of purplish haze, and are shot forth at the rate of 150,000 miles per second, the fastest speed ever accelerated by man. This is about 300,000 times faster than the speed of a bullet fired from a high-powered rifle.

The window through which the electrons are emitted is of metal foil only two-thousandths of an inch in thickness. This is absolutely holeproof, and is constructed to withstand an atmospheric pressure of more than 100 pounds, the difference between the outside air and the almost perfect vacuum within the tube.

Swing Gives Plenty of Exercise

In this recently devised exercise swing, a pumping foot-rail gives support to feet and a pair of aluminum sliding grips affords a firm hold.

A NEW swing has been developed that, in addition to the regular motion, affords plenty of exercise for the legs and back. A pumping foot-rail of steel gives a firm support for the feet, and a pair of sliding grips made of aluminum afford the swinger a good, firm hold. This device also tends to eliminate much of the danger attendant on using the ordinary swing.

The Living Fountain of Berlin

IN a Berlin restaurant, Mortado, a fakir who is winning widespread recognition as the only living fountain, daily sits for hours with water leaping from his hands and feet.

Science has helped Mortado, whose real name is Illmer, in preparing him for this feat. Some years ago he submitted to an operation that opened up several canals under the surface of his skin leading to his hands and feet. The special chair in which he sits is connected to the water pipes of the building. Concealed tubes from the chair to his arms and legs furnish the water pressure.

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$85 a Week for McCarty!

"Before taking up your course I was making $18 weekly as a clerk and knew nothing about music, but I made my first 'paid' performance in less than eight weeks after starting. Today I owe my salary of $85 a week as a professional Tenor Banjoist to your excellent training." Kenneth McCarty, Parkview Hotel, South Haven, Mich.

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PROBABLY like thousands of others whom I have helped find themselves, you have always thought of the Tenor Banjo as just a pastime — just a remarkable, melodious instrument for those who have "talent." . . . But stop a minute and think of earning $15, $20 or $25 a week EXTRA SPARE-TIME MONEY for two, three or four nights' fun! Look at the men pictured above. None of them had ever touched a string—ever read a single note.

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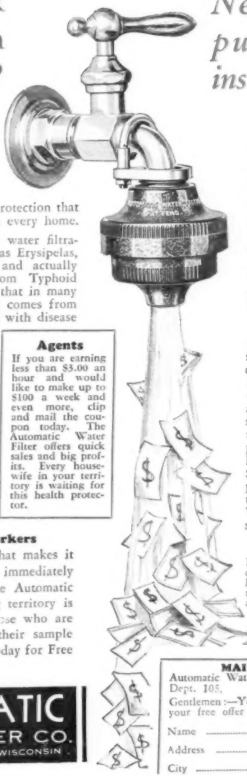

New invention purifies water instantly ... at the faucet!

Just imagine a device that purifies water instantly at the faucet and yet can be attached in a few seconds! Think of it— You can put on an Automatic Filter, let the water run for ten minutes, remove the filter and find enough dirt and filth to fill the bottom of a glass. When you see what this Filter does you will not want to be without it. It delivers pure, sparkling water, clear as crystal and free from germ laden filth.

FILTERS LIKE NATURE

It is just like bringing a bubbling spring into your kitchen. The principle of the Automatic Filter is just like nature. It forces the water thru crystal silica sand. The dirt and germs cannot pass thru the sand so the water that comes out of the faucet is clean, free from impurities, pleasing to the taste, and healthful to the body. Crystal Spring Water could be no more pure or healthful than the water that comes out of the Automatic Water Filter. It also prevents splashing.

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HERE'S good news for every light plane fan! Now you can select your favorite style ship—center wing, low wing, or Parasol type—and regardless of which type you choose—enjoy the great advantage of building with Heath parts and Heath plans—backed by 22 years of matchless performance in the light plane field.

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In choosing your favorite type ship—note the particular advantages of each wing construction and choose the style that best meets your individual tastes. The Heath low wing appeals to many flyers because of its trim appearance and because of its unusually low landing speed. However, it lacks the full visibility of the Parasol type. The Heath center wing has a slightly higher top speed, but lacks the full downward vision offered by the Parasol. The Heath Parasol type—over a long period of years, has proven to be the most thoroughly dependable type of all and offers complete visibility above and below—and to each side. Experience has shown it to be ideal for the new flyer because of its inherent stability.

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Take advantage of the long winter evenings—and start building your Heath plane now. Thousands have completed their Parasols in a remarkably short time and declare it transforms dull winter evenings into hours of genuine pleasure, education, and experience. No technical training is necessary as Heath plans are clear and easy to follow. Parts are shipped in 11 convenient progressive groups. $12.00 brings the first shipment! Parts complete only $199—and if you want the Parasol ready to fly away—the price is only $975.

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